RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

FCC & IC Certification Report

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Model: M7300 VHF

FCC ID: OWDTR-0056-E
IC: 3636B-0056

December 22, 2011

Standards Referenced for this Report	
Part 2: 2011	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 90: 2011	Private Land Mobile Radio Services
TIA-EIA-603-C August 2004	Land Mobile FM or PM Communications Equipment – Measurement and Performance Standards
ANSI/TIA/EIA – 102.CAAA-2002	Digital C4FM/CQPSK Transceiver Measurement Methods
ANSI/TIA/EIA– 102.BAAA–1998	Project 25 FDMA Common Air Interface—New Technology Standards Project—Digital Radio Technical Standards
RSS-119 Issue 11	Land Mobile and Fixed Radio Transmitters and Receivers 27.41 to 960.0 MHz
SRSP-500	Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Bands 138-144 MHz and 148-174 MHz

Report Prepared By: Daniel Baltzell

Document Number: 2011200

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

Frequency Range (MHz)	Rated Conducted Output Power (W)	Frequency Tolerance (ppm)	Emission Designator
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	11K0F3E (NB Analog Voice)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	9K90F1D (2 level NB 9600 FSK)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	9K90F1E (2 level NB 9600 FSK)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	7K10F1D (2 level NB 4800 FSK)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	7K10F1E (2 level NB 4800 FSK)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	8K40F1D (OpenSky/TDMA)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	8K40F1E (OpenSky/TDMA)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	8K40F1D (P25)
136-150 (Federal) 150-174 (FCC) 138-174 (IC)	110.0	-0.18	8K40F1E (P25)

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1 Test Result Summary

Test	FCC Reference	IC Reference	Result
RF Power Output	2.1046(a), 90.205	RSS-119 5.4	Complies
Spurious Emissions at Antenna Terminals	2.1046(a), 90.210	RSS-119 5.5, 5.8	Complies
Field Strength of Spurious Radiation	2.1053(a), 90.210	RSS-119 5.5, 5.8	Complies
Occupied Bandwidth/Emission Masks	2.1049(c)(1), 90.210	RSS-119 5.5, 5.8	Complies
Frequency Stability vs. Temperature and Voltage	2.1055, 90.213	RSS-119 5.3	Complies
Modulation Characteristics	2.1047(a)(b)	N/A	Complies
Transient Frequency Response	90.214	RSS-119 5.9	Complies

2 General Information

The following Type Certification Report is prepared on behalf of **Harris Corporation** in accordance with the Federal Communications Commission and Industry Canada Rules and Regulations. The Equipment Under Test (EUT) was the **M7300 VHF,** a 110 Watt Mobile Radio; **FCC ID: OWDTR-0056-E, IC: 3636B-0056.**

The radio is subject to FCC DoC due to the optional data connection through the UDC connector. DoC testing was performed for the aforementioned accessories and configurations, and the data is contained in a separate DoC report.

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47 Parts 2 and 90, and Industry Canada RSS-119. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

2.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to, and approved by, the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

2.2 Related Submittal(s)/Grant(s)

This is a new certification application for FCC and Industry Canada. .

2.3 Grant Notes

Power is continuously variable from 50 - 110 W. The grant listed power is rated power.

2.4 Tested System Details

The test sample was received on December 22, 2011. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this test, as applicable. The device was programmed for multiple modes of operation and modulation types.

The EUT has two versions – a System version and a Scan version. The System version adds a DTMF keypad; the System version was used in testing, as it was deemed to represent the potential for worst-case emissions.

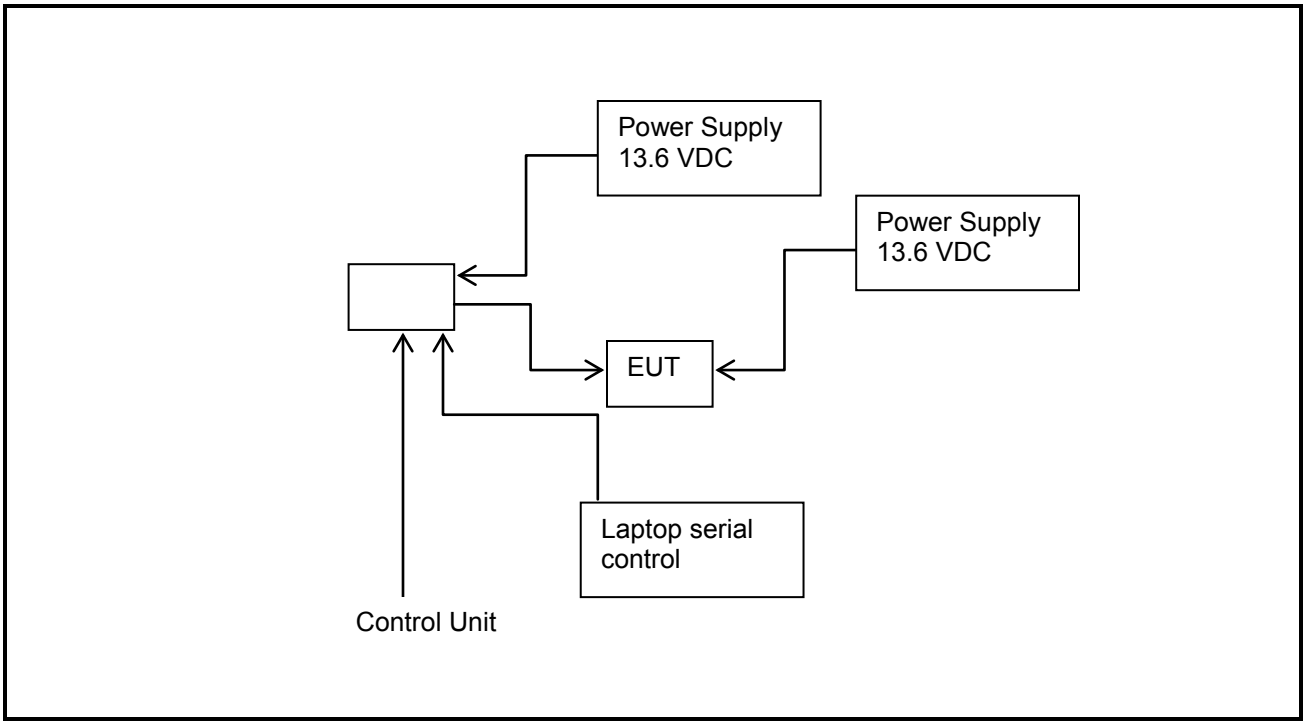
Table 2-1: Equipment Under Test (EUT)

Model	Manufacturer	Model #	Part Number	FCC ID	RTL Bar Code
M7300 VHF 110 W Mobile Radio	Harris Corporation	MAMW-SHHXX	RU144750-051	OWDTR-0056-E	20505
M7300 VHF 110 W Mobile Radio	Harris Corporation	MAMW-SHHXX	RU144750-051	OWDTR-0056-E	20504
Remote Mount Control Head - System	Harris Corporation	CH721	CU23218-0004	N/A	20503
Remote Mount Control Head - Scan	Harris Corporation	CH721	CU23218-0002	N/A	20503
Microphone	Harris Corporation	MC-101616-040	MC-101616-040	N/A	20422
DTMF Microphone	Harris Corporation	MC103334-040	MC103334-040	N/A	N/A
30” Unshielded CAN Cable	Harris Corporation	CAN Cable	CA-009562	N/A	N/A
Unshielded DC Power Cable	Harris Corporation	Power Cable	14002-0167	N/A	N/A
External RF Cavity Filter	Harris Corporation	FL-017938-030	FL-017938-030	N/A	N/A

Table 2-2: Antenna/Mount for this Radio

Model	Manufacturer	Model #	Part Number	FCC ID	RTL Bar Code
Antenna Element VHF 0 dB	Harris Corporation	AN-225002-001	AN-225002-001	N/A	N/A
Roof Mount Antenna Base with GPS	Harris Corporation	AN-125001-005	AN-125001-005	N/A	20506

Figure 2-1: Configuration of Tested System



3 FCC Rules and Regulations Part 2.1033(C)(8) Voltages & Currents Through The Final Amplifying Stage

13.6 VDC / 18.2 A

4 FCC Rules and Regulations Part 2.1046(a): RF Power Output: Conducted, Part 90.205 Transmitting Power Limits, RSS-119 5.4: Transmitter Output Power

4.1 Test Procedure

ANSI/TIA/EIA-603-2002, section 2.2.1

The EUT was connected to a coaxial attenuator having a 50 Ω load impedance.

Manufacturer's Rated Power: 110 W

4.2 Test Data

Table 4-1: RF Conducted Output Power - Measured

Frequency (MHz)	High Power (dBm)	High Power (W)	Low Power (dBm)	Low Power (W)
136.0125	50.7	118.6	47.4	55.2
138.0	50.7	117.5	47.4	54.7
141.0	50.6	115.6	47.3	53.8
144.0	50.6	115.3	47.3	53.6
148.0	50.6	115.3	47.3	53.6
150.0	50.6	115.6	47.3	53.6
162.0	50.6	114.0	47.4	55.0
173.9875	50.7	116.7	47.4	55.1

Notes: Data presented is for analog mode. All other modes were investigated and found to have equivalent power within measurement tolerances.

Table 4-2: Test Equipment Used For Testing RF Power Output - Conducted

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	1/20/12
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	1/20/12
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC 1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell		December 23, 2011
EMC Test Engineer	Signature	Date of Test

5 FCC Rules and Regulations Part 2.1051: Spurious Emissions at Antenna Terminals; Part 90.210: Emission Limitations, RSS-119 5.8: Transmitter Unwanted Emissions

5.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.13

The transmitter is terminated with a 50 Ω load and interfaced with a spectrum analyzer.

Device with digital modulation: Modulated to its maximum extent using a pseudo-random data.

5.2 Test Data

Frequency range of measurement per Part 2.1057: 9 kHz to 10 x Fc

Limits: (50 + 10 LOG P(W))

The following channels (MHz) were investigated: 136.0125, 138.0, 141.0, 144.0, 148.0, 150.0, 162.0 and 173.9875. Both high and low power settings were checked; high power was found to be worst case. All modes were investigated, and analog mode is presented as representative data.

Results: All conducted spurious emissions are greater than 20 dB below the limit; no data needs to be presented.

Table 5-1: Test Equipment Used For Testing Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	1/13/12
901129	Par Electronics	118-174 (25W)	VHF Notch Filter	N/A	3/10/12
900957	Weinschel Corp	68-20-43	100W Attenuator 20 dB	LT394	2/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell		December 23, 2011
EMC Test Engineer	Signature	Date of Test

6 FCC Rules and Regulations Part 2.1053(a): Field Strength of Spurious Radiation; Part 90 90.210 Out of Band Emissions Limit; RSS-119 5.8: Unwanted Emissions

6.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.12

Analog Modulation: The transmitter is terminated with a 50 Ω load and is modulated with a 2,500 Hz sine wave at an input level 16 dB greater than that required to produce 50% of the rated system deviation at 1,000 Hz. Device with digital modulation: Modulated to its maximum extent using a pseudo-random data.

The spurious emissions levels were measured, and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole. The narrowband limit of 50+10 log(P) was used.

6.2 Test Data

6.2.1 CFR 47 Part 90.210 Requirements

The worst-case emissions test data are shown.

Table 6-1: Field Strength of Spurious Radiation – 136.0125 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
272.0250	74.9	-46.8	0.6	1.7	96.4	-25.7
408.0375	74.2	-43.9	0.7	1.9	93.4	-22.7
544.0500	55.3	-59.3	0.7	0.5	110.2	-39.5
680.0625	56.7	-54.7	0.8	1.3	104.9	-34.2
816.0750	55.8	-52.2	0.9	1.1	102.7	-32.0
952.0875	57.9	-52.2	0.9	1.6	102.2	-31.5
1088.1000	46.3	-64.3	1.0	4.3	111.7	-41.0
1224.1125	35.7	-75.7	1.0	4.9	122.5	-51.8
1360.1250	38.8	-70.7	1.1	5.6	116.9	-46.2

Table 6-2: Field Strength of Spurious Radiation – 138.0 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
276.0000	73.7	-48.0	0.6	1.7	97.6	-26.9
414.0000	69.0	-48.9	0.7	1.8	98.5	-27.8
552.0000	59.5	-54.9	0.7	1.3	105.0	-34.3
690.0000	63.3	-47.8	0.8	1.3	98.0	-27.3
828.0000	57.6	-50.1	0.9	1.1	100.6	-29.9
966.0000	60.7	-50.4	0.9	1.7	100.3	-29.6
1104.0000	42.4	-70.6	1.0	4.3	118.0	-47.3
1242.0000	37.1	-74.0	1.0	4.9	120.8	-50.1
1380.0000	36.3	-72.8	1.1	5.7	118.9	-48.2

Table 6-3: Field Strength of Spurious Radiation – 141 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
282.0000	71.5	-50.1	0.6	1.7	99.6	-29.0
423.0000	62.2	-55.5	0.7	1.8	105.0	-34.4
564.0000	65.3	-48.8	0.7	1.3	98.8	-28.2
705.0000	64.1	-46.6	0.8	1.3	96.7	-26.1
846.0000	57.8	-49.5	0.9	1.1	99.9	-29.3
987.0000	62.0	-50.1	0.9	1.8	99.8	-29.2
1128.0000	48.4	-64.4	1.0	4.4	111.6	-41.0
1269.0000	44.8	-65.9	1.0	5.0	112.5	-41.9
1410.0000	41.4	-69.8	1.1	5.9	115.6	-45.0

Table 6-4: Field Strength of Spurious Radiation – 144 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
288.0000	73.4	-48.2	0.5	1.5	97.8	-27.2
432.0000	65.3	-52.4	0.6	1.8	101.8	-31.2
576.0000	69.9	-44.2	0.7	1.3	94.2	-23.6
720.0000	60.8	-49.9	0.8	1.3	100.0	-29.3
864.0000	60.0	-47.3	0.8	1.2	97.6	-26.9
1008.0000	65.1	-47.0	0.8	4.4	94.0	-23.4
1152.0000	55.7	-57.1	0.9	4.5	104.1	-33.5
1296.0000	45.3	-65.4	1.0	5.1	111.9	-41.3
1440.0000	48.0	-63.2	1.1	6.1	108.8	-38.2

Table 6-5: Field Strength of Spurious Radiation – 148 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
296.0000	66.9	-54.4	0.6	1.7	103.9	-33.3
444.0000	75.1	-42.1	0.7	1.7	91.7	-21.1
592.0000	60.6	-52.8	0.8	1.2	103.0	-32.4
740.0000	62.5	-47.4	0.8	1.2	97.6	-27.0
888.0000	59.1	-48.4	0.9	1.3	98.6	-28.0
1036.0000	63.8	-49.8	1.0	4.4	97.0	-26.4
1184.0000	50.4	-61.7	1.0	4.7	108.6	-38.0
1332.0000	40.5	-69.3	1.0	5.4	115.5	-44.9
1480.0000	33.6	-74.7	1.1	6.3	120.1	-49.5

Table 6-6: Field Strength of Spurious Radiation – 150 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
300.0000	71.2	-50.0	0.6	1.7	99.5	-28.9
450.0000	72.0	-45.0	0.7	1.7	94.6	-24.0
600.0000	59.2	-54.0	0.8	1.2	104.2	-33.6
750.0000	65.8	-43.8	0.8	1.2	94.0	-23.4
900.0000	47.4	-70.7	0.9	1.3	120.9	-50.3
1050.0000	51.3	-62.2	1.0	4.4	109.4	-38.8
1200.0000	47.5	-64.3	1.0	4.8	111.1	-40.5
1350.0000	33.2	-76.5	1.1	5.5	122.7	-52.1
1500.0000	37.9	-70.6	1.1	6.5	115.8	-45.2

Table 6-7: Field Strength of Spurious Radiation – 162 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
324.0000	73.3	-47.5	0.6	1.7	97.0	-26.4
486.0000	67.6	-48.5	0.7	1.5	98.3	-27.7
648.0000	48.8	-63.1	0.8	1.3	113.2	-42.6
810.0000	43.7	-64.5	0.9	1.0	115.0	-44.4
972.0000	41.5	-69.9	0.9	1.7	119.7	-49.1
1134.0000	35.0	-77.7	1.0	4.4	124.9	-54.3
1296.0000	29.9	-80.3	1.0	5.1	126.8	-56.2
1458.0000	37.2	-70.8	1.1	6.2	116.3	-45.7
1620.0000	37.8	-70.9	1.2	6.7	116.0	-45.4

Table 6-8: Field Strength of Spurious Radiation – 173.9875 MHz – Analog High Power

Frequency (MHz)	Spectrum Analyzer Level (dBuV/M)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Corrected Signal Generator (dBc)	Margin (dB)
347.9500	78.0	-42.2	0.6	1.8	91.7	-21.0
521.9250	54.3	-60.9	0.7	1.3	111.0	-40.3
695.9000	51.7	-59.3	0.8	1.3	109.5	-38.8
869.8750	50.8	-55.9	0.9	1.2	106.3	-35.6
1043.8500	42.8	-70.7	1.0	4.4	118.0	-47.3
1217.8250	40.0	-71.5	1.0	4.8	118.4	-47.7
1391.8000	28.6	-80.2	1.1	5.8	126.2	-55.5
1565.7750	48.2	-61.1	1.2	6.7	106.3	-35.6
1739.7500	33.4	-73.6	1.3	6.5	119.1	-48.4

Table 6-9: Test Equipment Used For Testing Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	1/31/13
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/14/12
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/14/12
901235	IW Microwave Products	KPS-1503-360-KPS	High Frequency RF Cables	36"	7/8/12
900878	Rhein Tech Laboratories, Inc.	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901242	Rhein Tech Laboratories, Inc.	WRT-000-0003	Wood rotating table	N/A	Not Required
900928	Hewlett Packard	83752A	Synthesized Sweeper, (0.01 - 20 GHz)	3610A00866	2/17/12
901262	ETS	3160-9	Double ridged Guide Antenna (1 - 18 GHz)	6748	5/1/12
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	4/10/12
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	1/13/12

Test Personnel:

Daniel Baltzell		January 11, 2012
Test Engineer	Signature	Date of Test

7 FCC Rules and Regulations Part 2.1049(c)(1): Occupied Bandwidth; Part 90.210 Authorized Bandwidth; RSS-119 5.8: Transmitter Unwanted Emissions

Occupied Bandwidth - Compliance with the Emission Masks

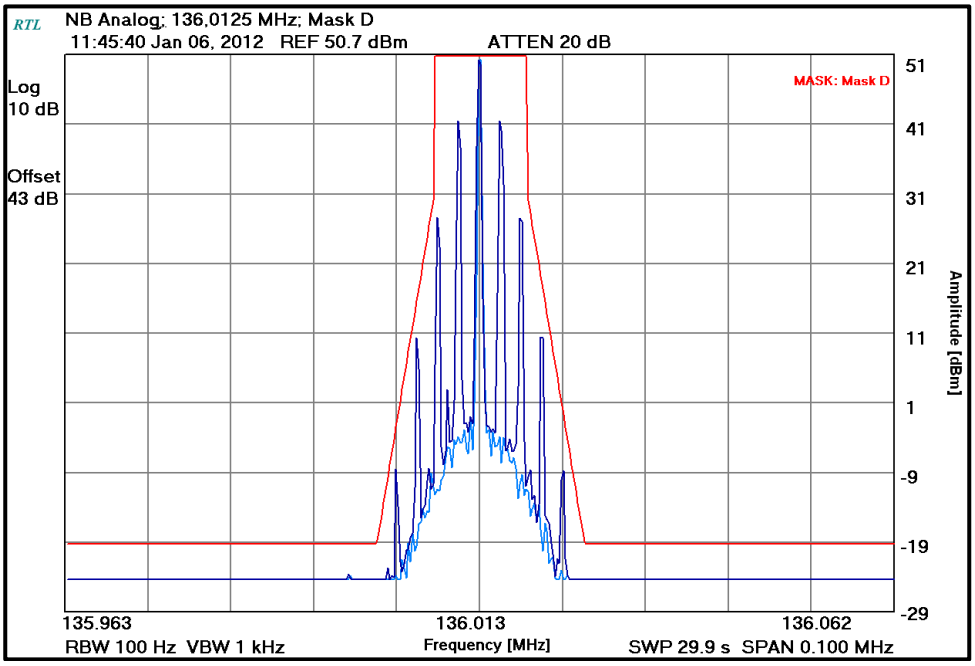
7.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.11 and TIA/EIA-102.CAAA-2002 Section 2.2.5

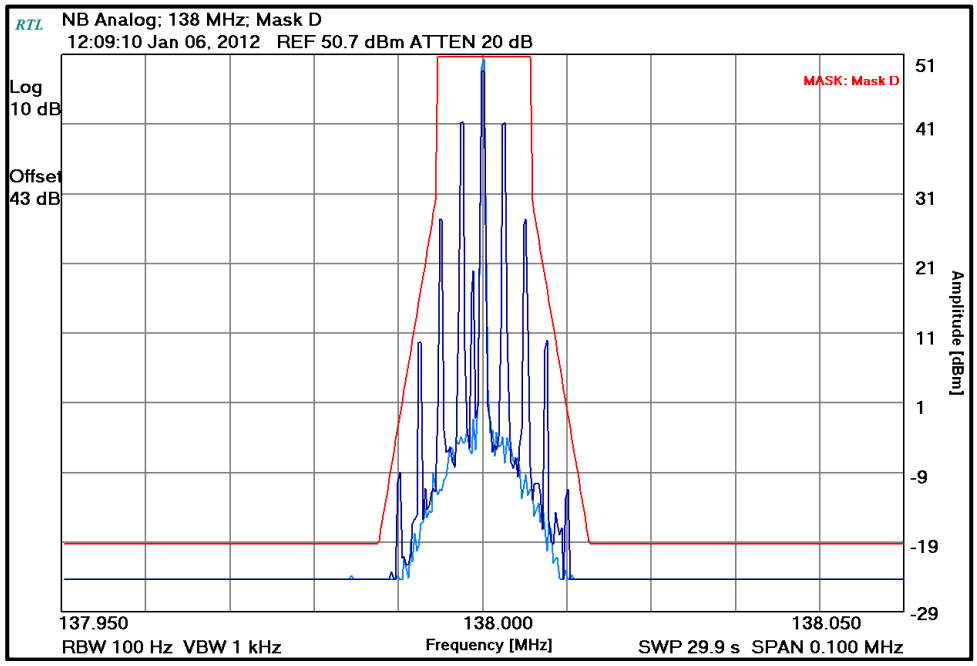
Device with digital modulation: Modulated to its maximum extent using a pseudo-random data sequence.

7.2 Test Data

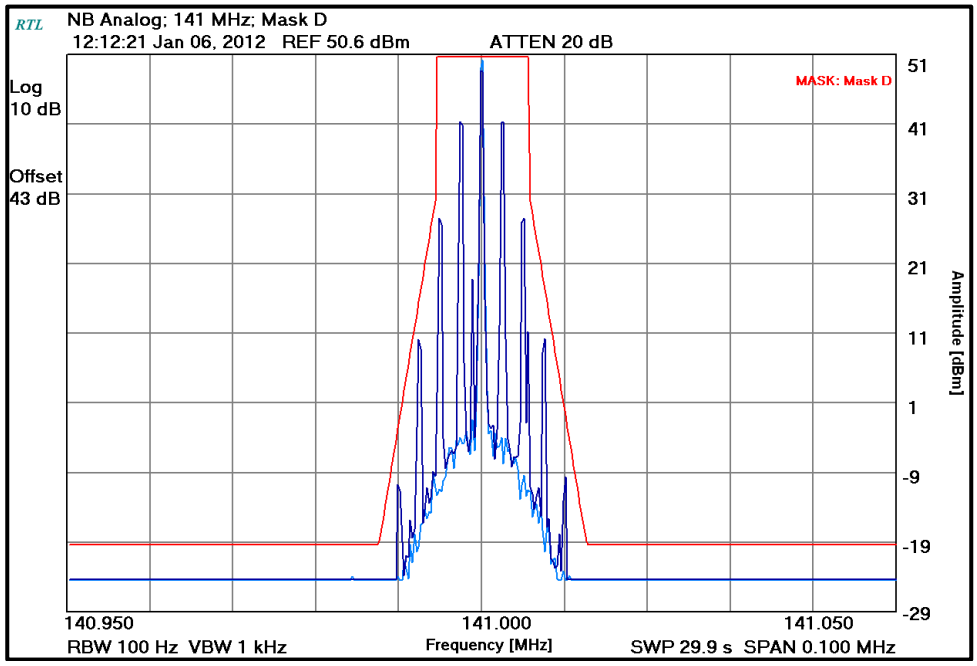
Plot 7-1: Occupied Bandwidth – 136.0125 MHz; NB Analog (Mask D)



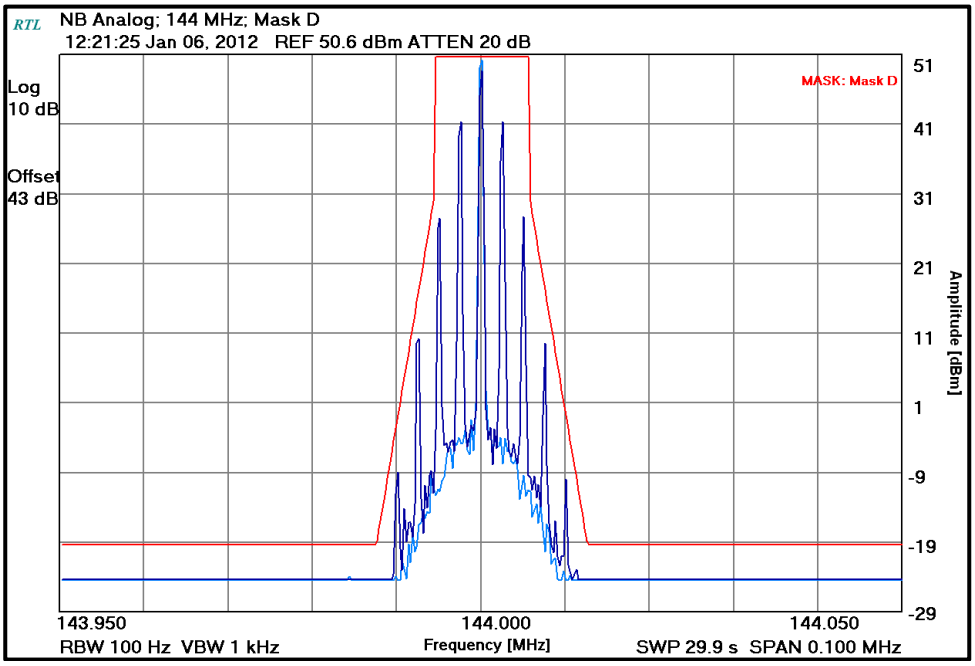
Plot 7-2: Occupied Bandwidth – 138.0 MHz; NB Analog (Mask D)



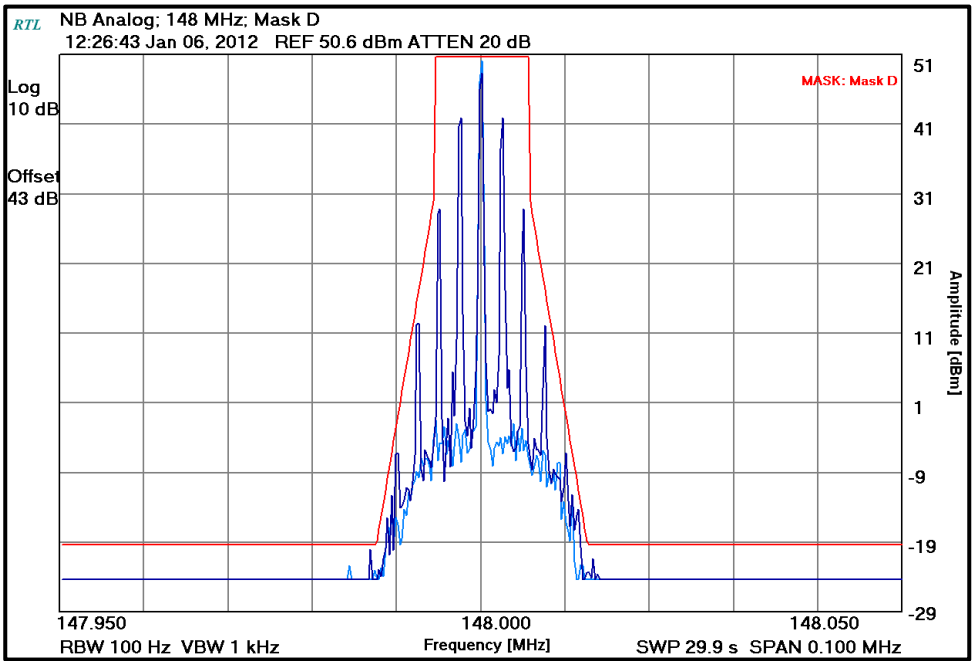
Plot 7-3: Occupied Bandwidth – 141 MHz; NB Analog (Mask D)



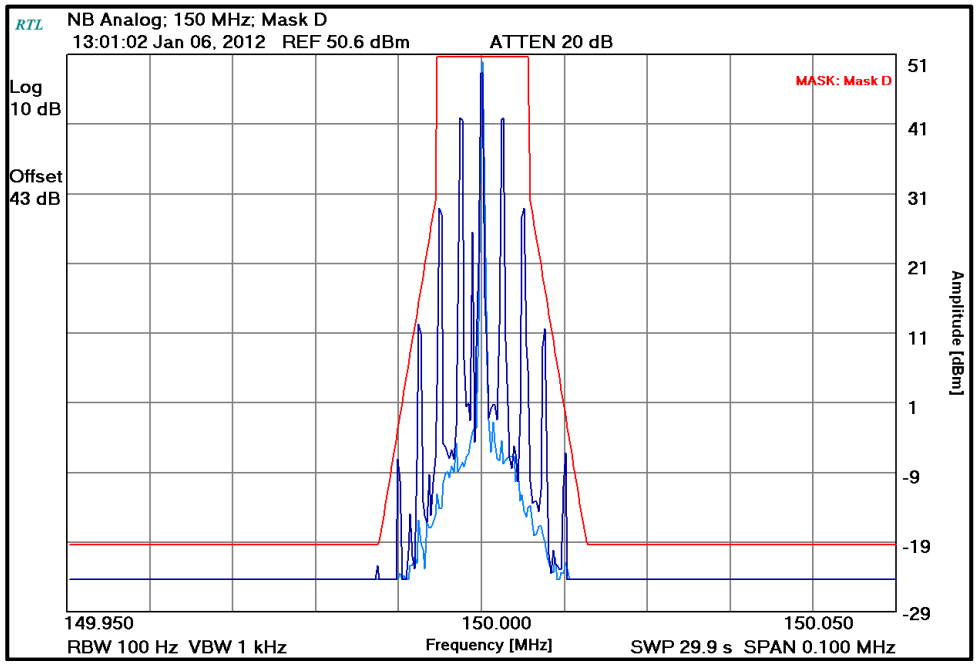
Plot 7-4: Occupied Bandwidth – 144 MHz; NB Analog (Mask D)



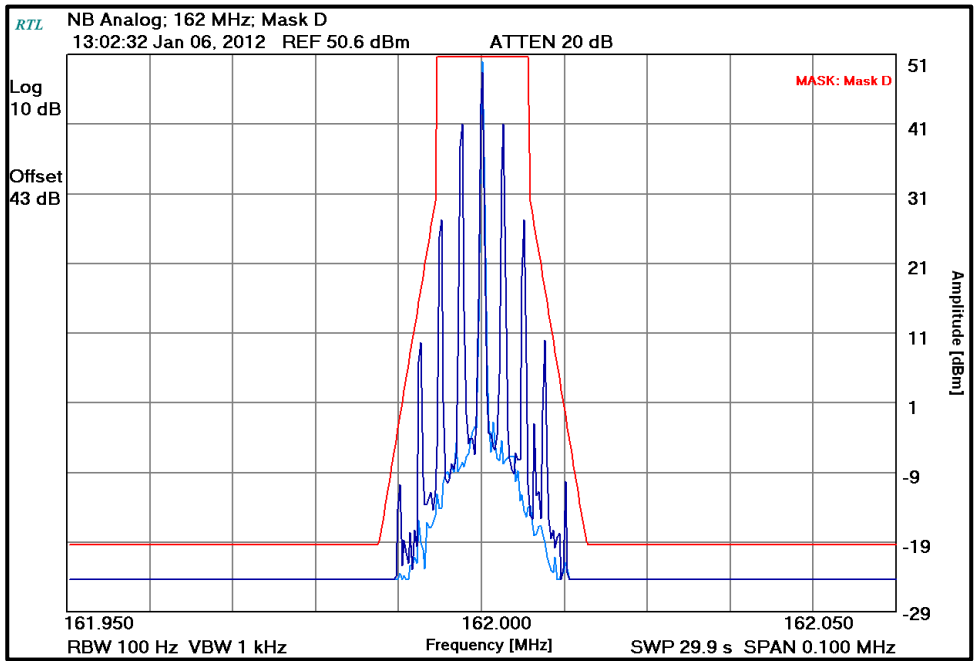
Plot 7-5: Occupied Bandwidth – 148 MHz; NB Analog (Mask D)



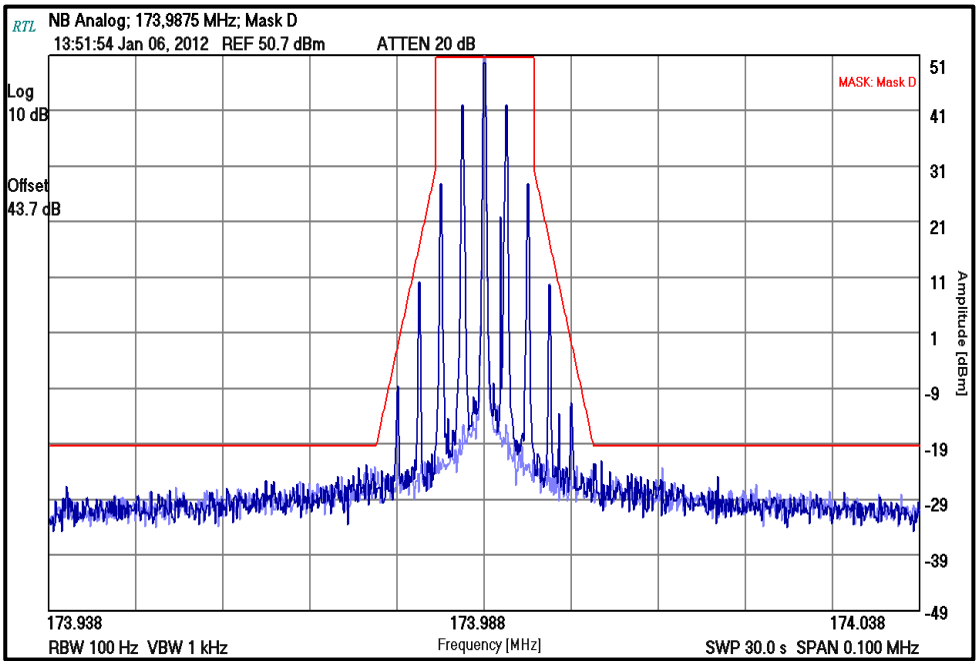
Plot 7-6: Occupied Bandwidth – 150 MHz; NB Analog (Mask D)



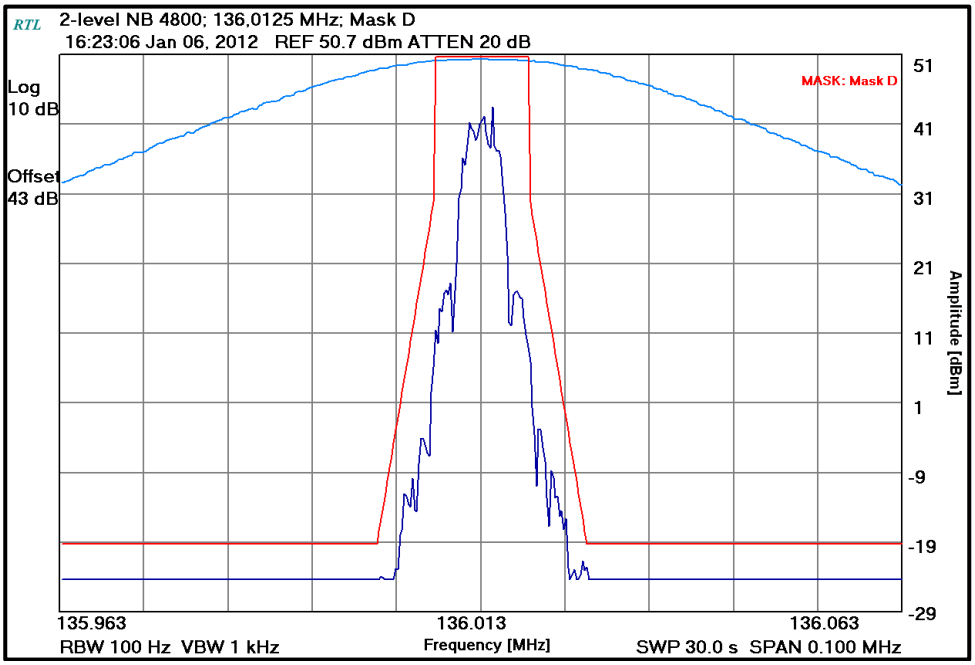
Plot 7-7: Occupied Bandwidth – 162 MHz; NB Analog (Mask D)



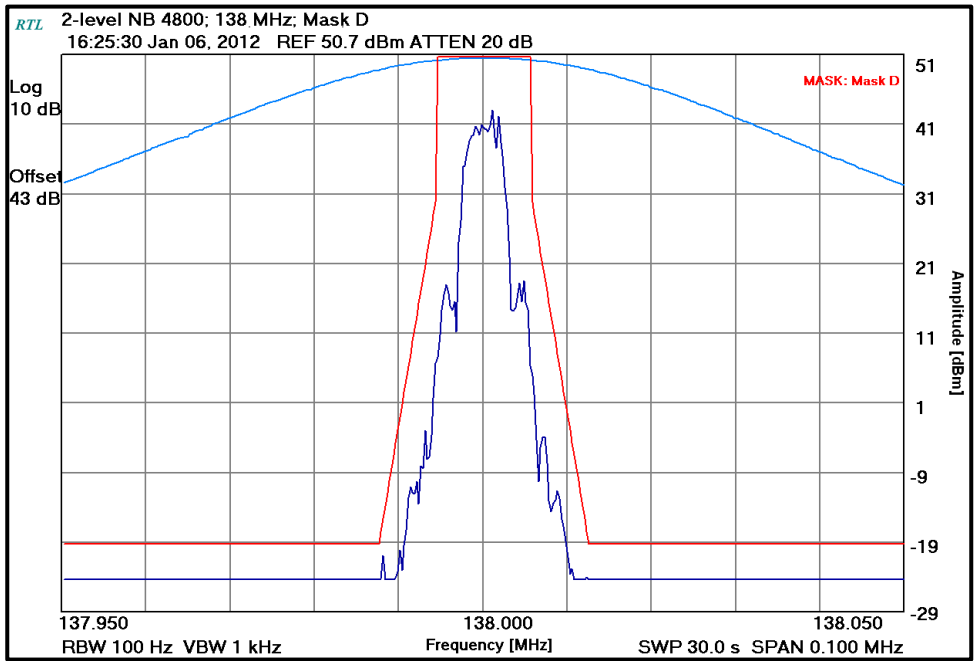
Plot 7-8: Occupied Bandwidth – 173.9875 MHz; NB Analog (Mask D)



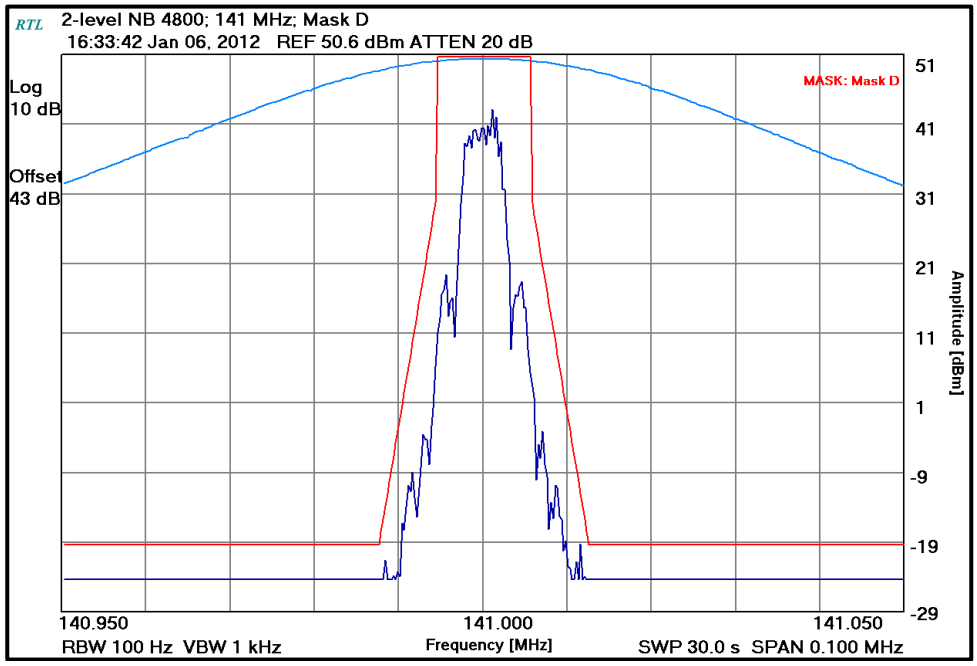
Plot 7-9: Occupied Bandwidth – 136.0125 MHz; 2 level NB 4800 (Mask D)



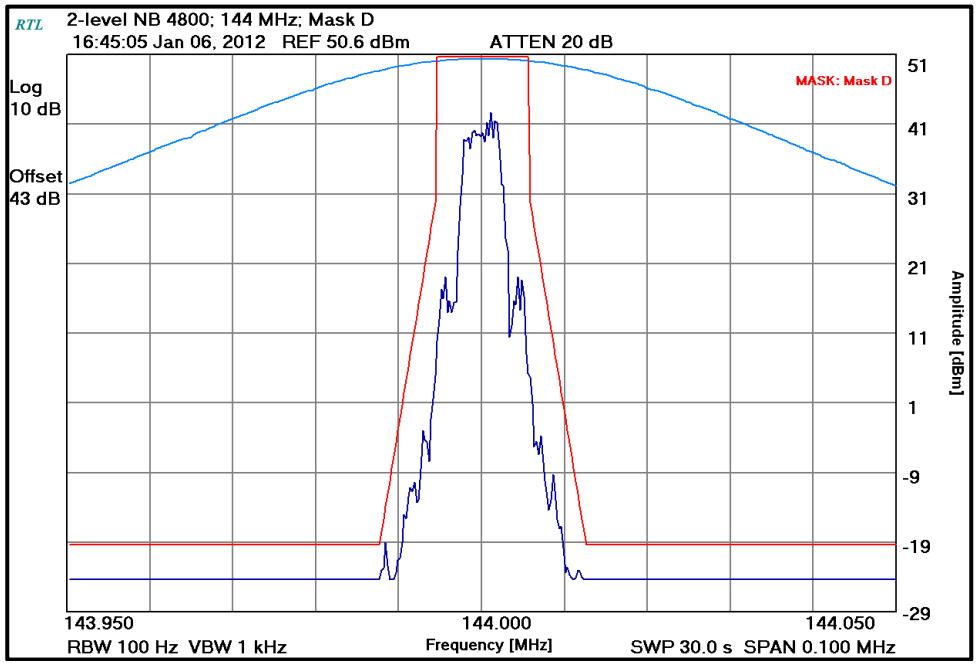
Plot 7-10: Occupied Bandwidth – 138.0 MHz; 2 level NB 4800 (Mask D)



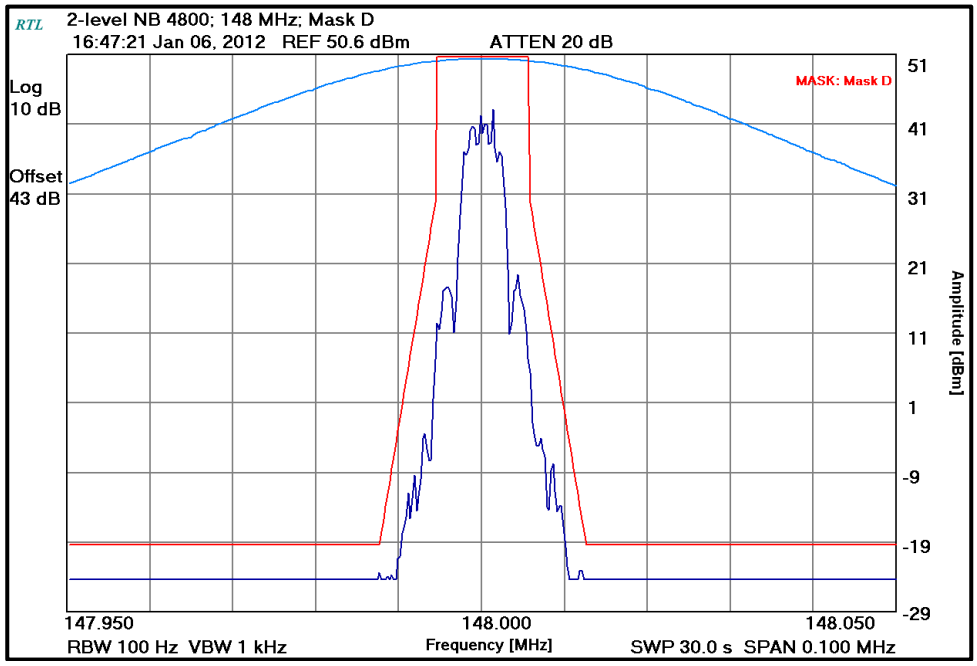
Plot 7-11: Occupied Bandwidth – 141 MHz; 2 level NB 4800 (Mask D)



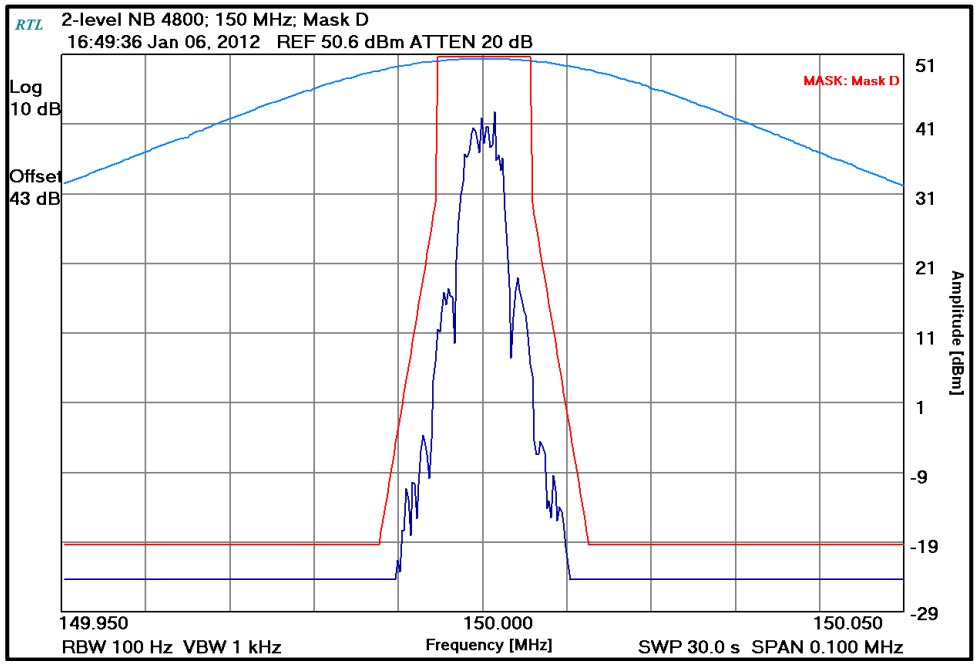
Plot 7-12: Occupied Bandwidth – 144 MHz; 2 level NB 4800 (Mask D)



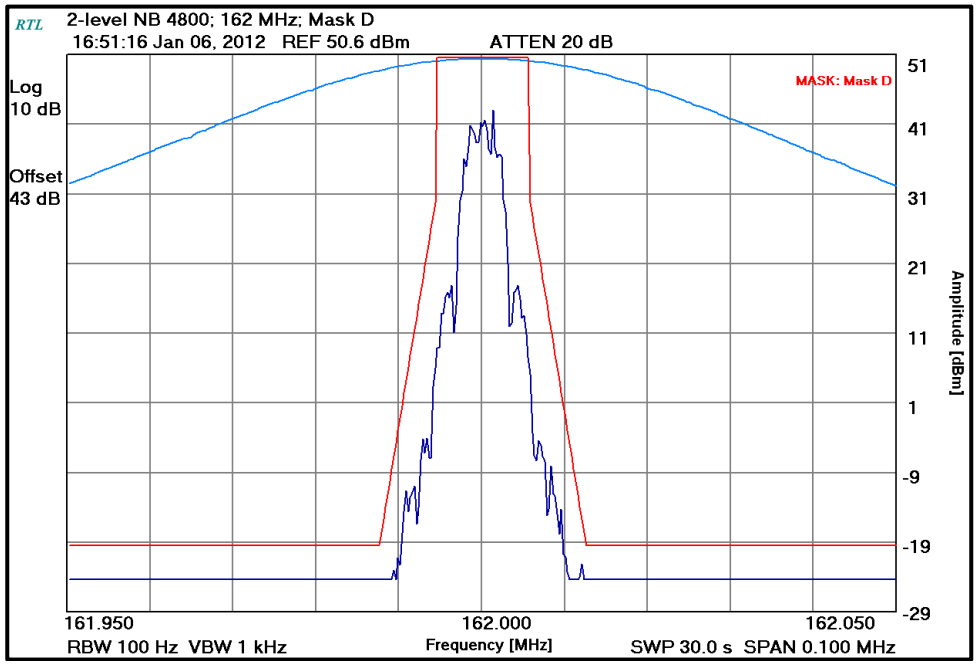
Plot 7-13: Occupied Bandwidth – 148 MHz; 2 level NB 4800 (Mask D)



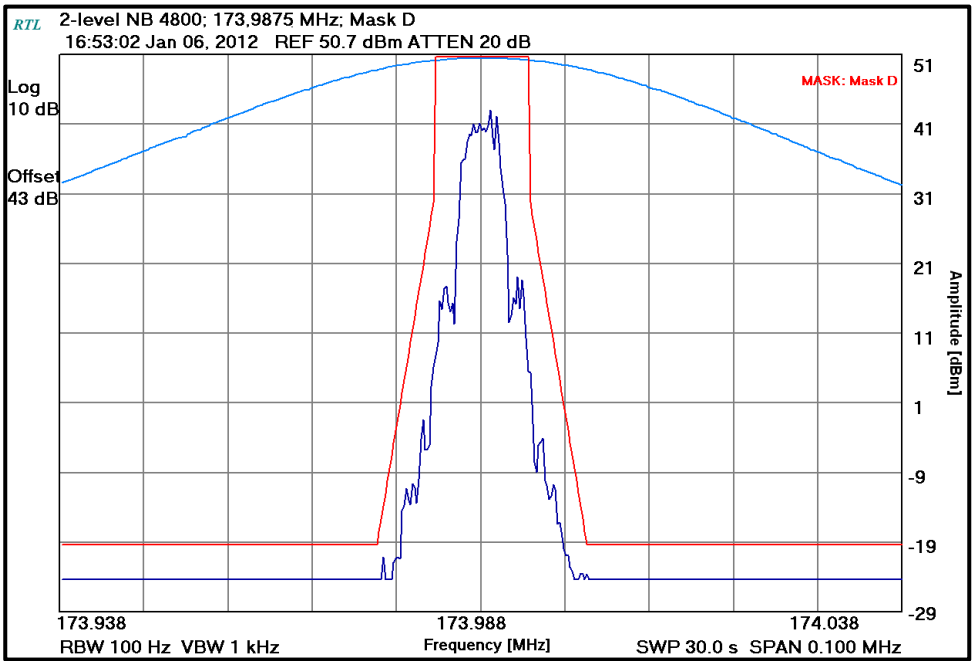
Plot 7-14: Occupied Bandwidth – 150 MHz; 2 level NB 4800 (Mask D)



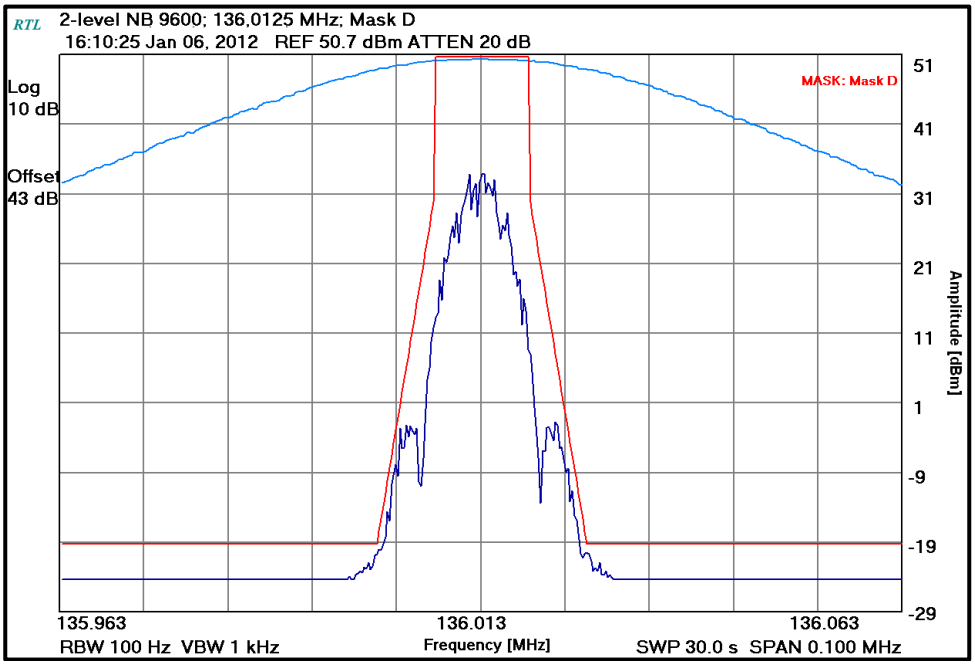
Plot 7-15: Occupied Bandwidth – 162 MHz; 2 level NB 4800 (Mask D)



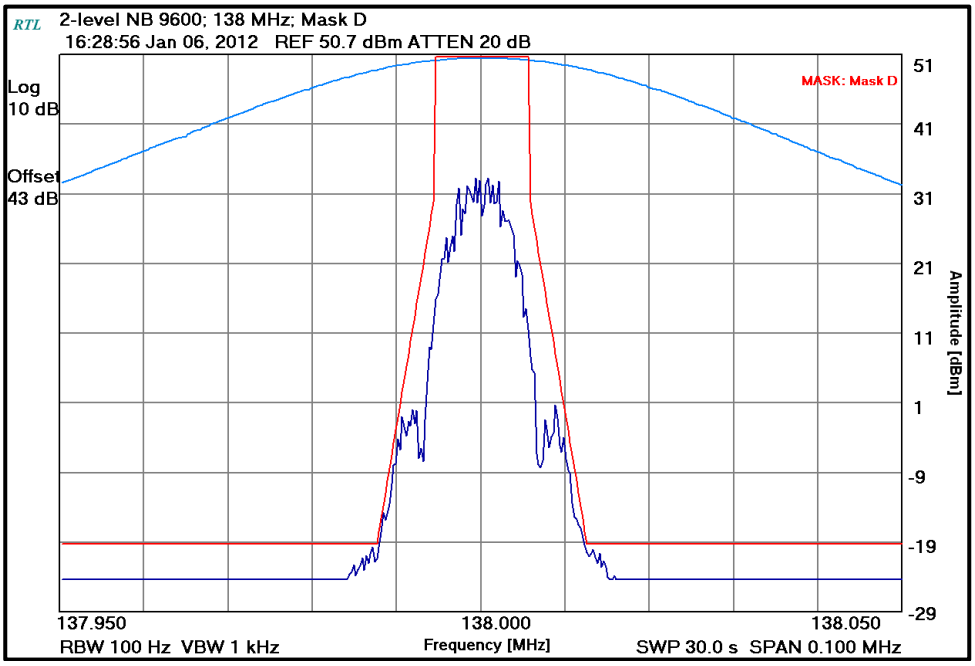
Plot 7-16: Occupied Bandwidth – 173.9875 MHz; 2 level NB 4800 (Mask D)



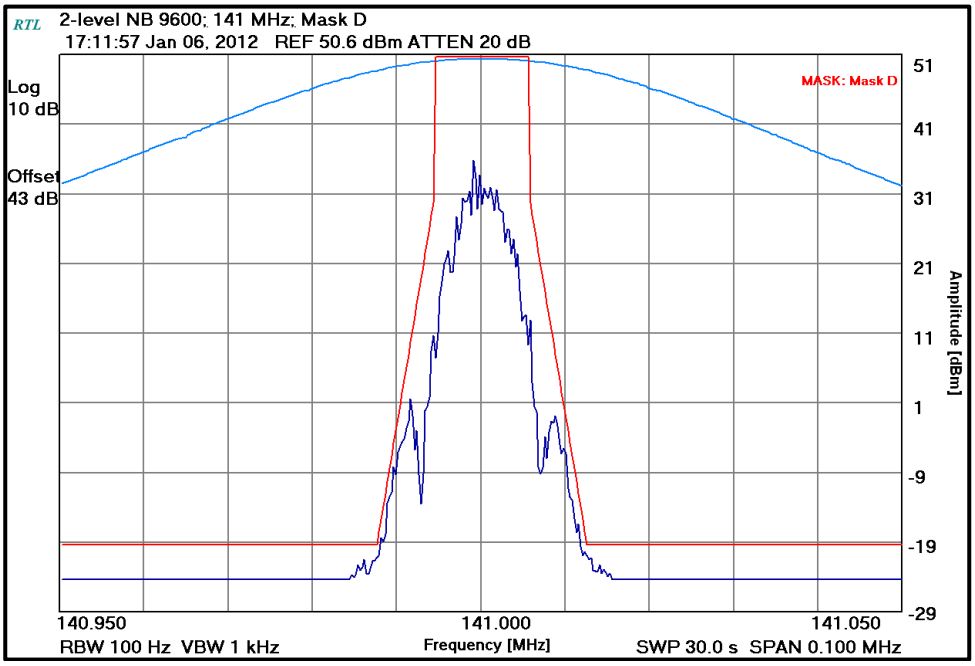
Plot 7-17: Occupied Bandwidth – 136.0125 MHz; 2 level NB 9600 (Mask D)



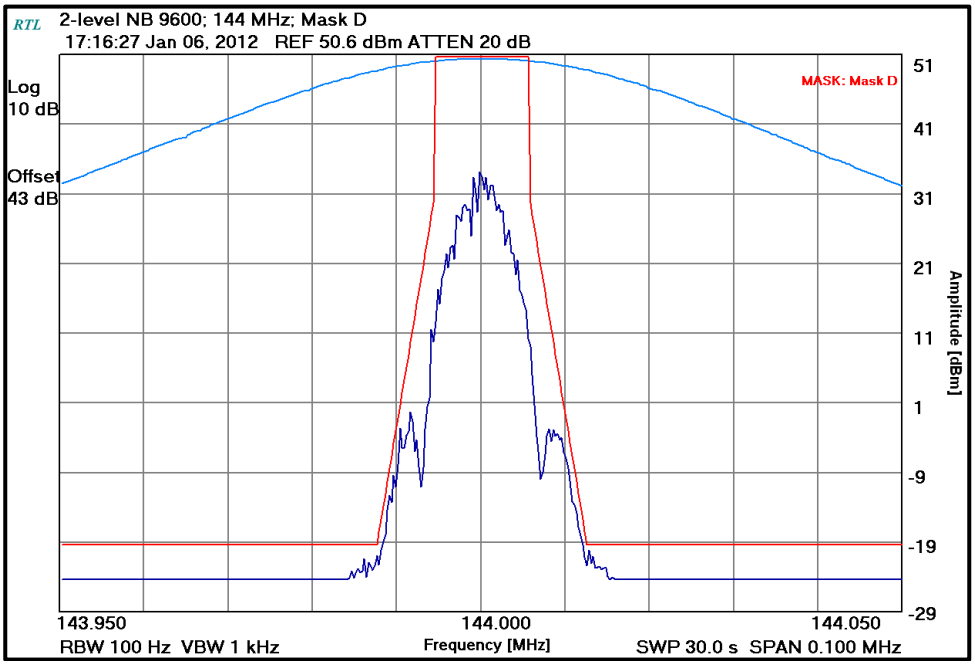
Plot 7-18: Occupied Bandwidth – 138.0 MHz; 2 level NB 9600 (Mask D)



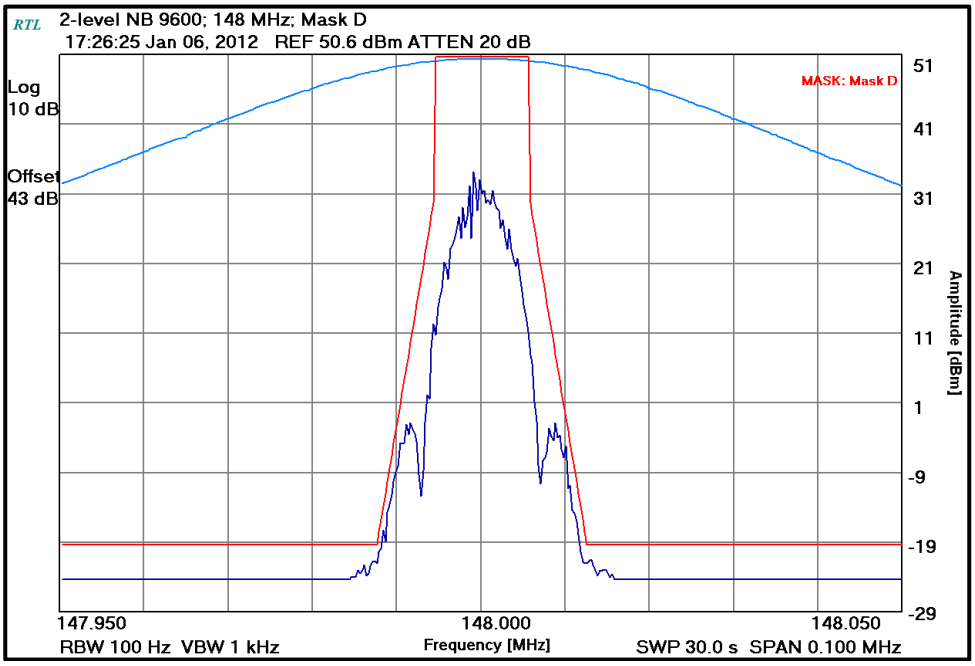
Plot 7-19: Occupied Bandwidth – 141 MHz; 2 level NB 9600 (Mask D)



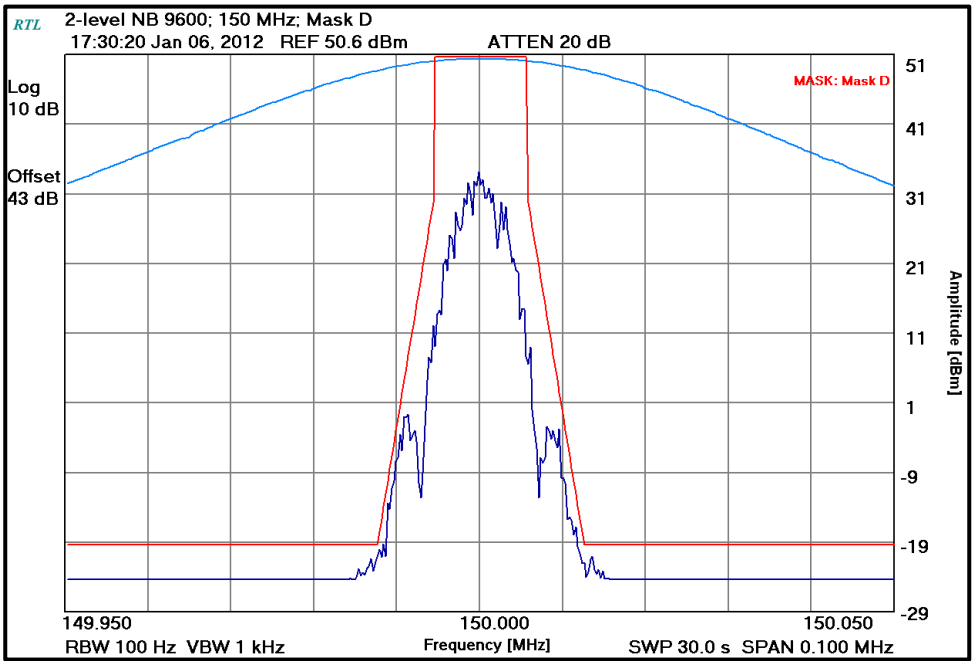
Plot 7-20: Occupied Bandwidth – 144 MHz; 2 level NB 9600 (Mask D)



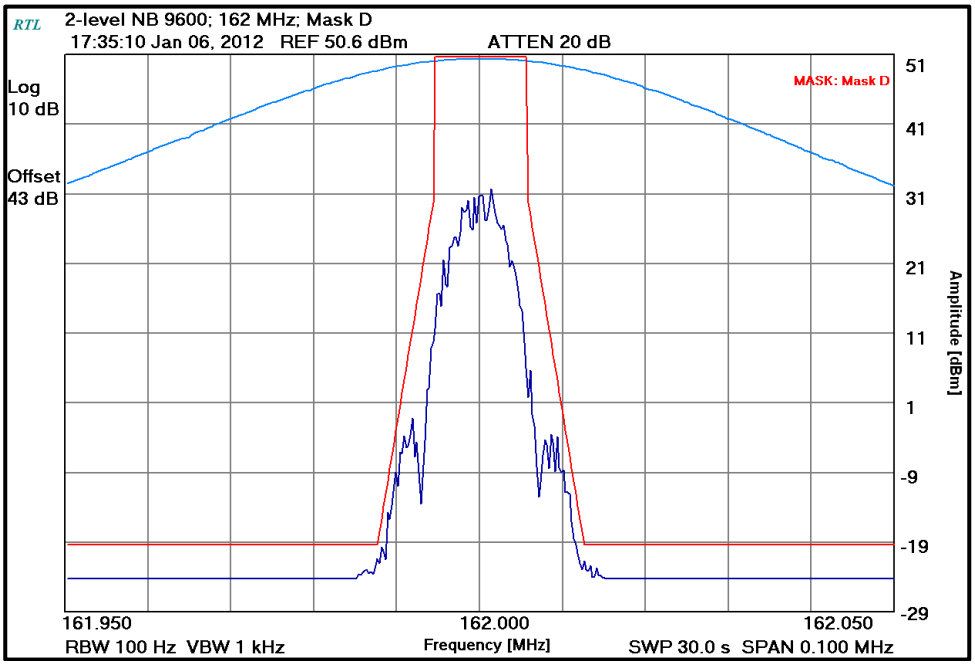
Plot 7-21: Occupied Bandwidth – 148 MHz; 2 level NB 9600 (Mask D)



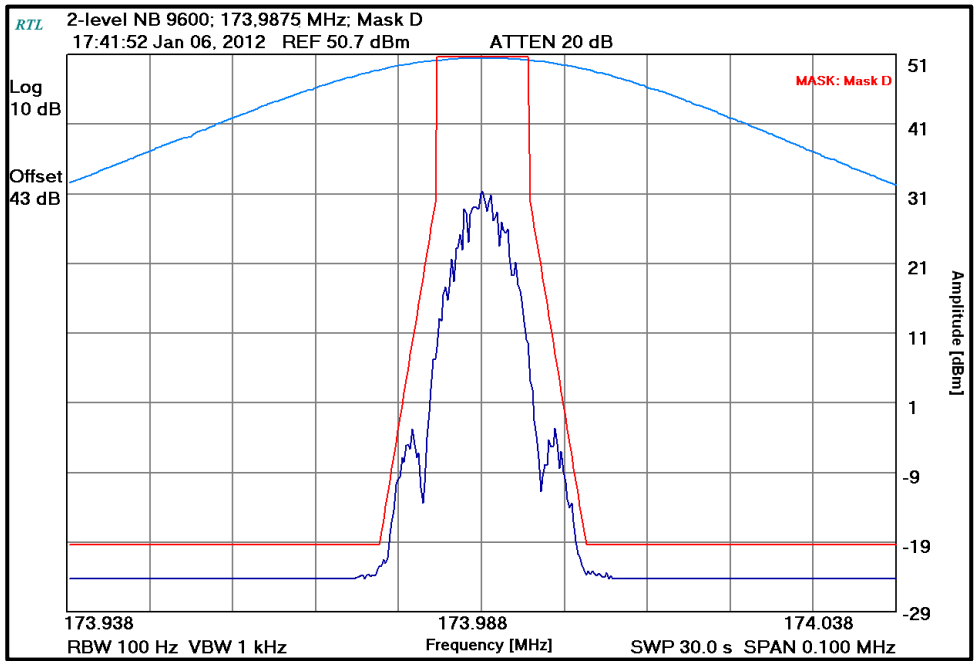
Plot 7-22: Occupied Bandwidth – 150 MHz; 2 level NB 9600 (Mask D)



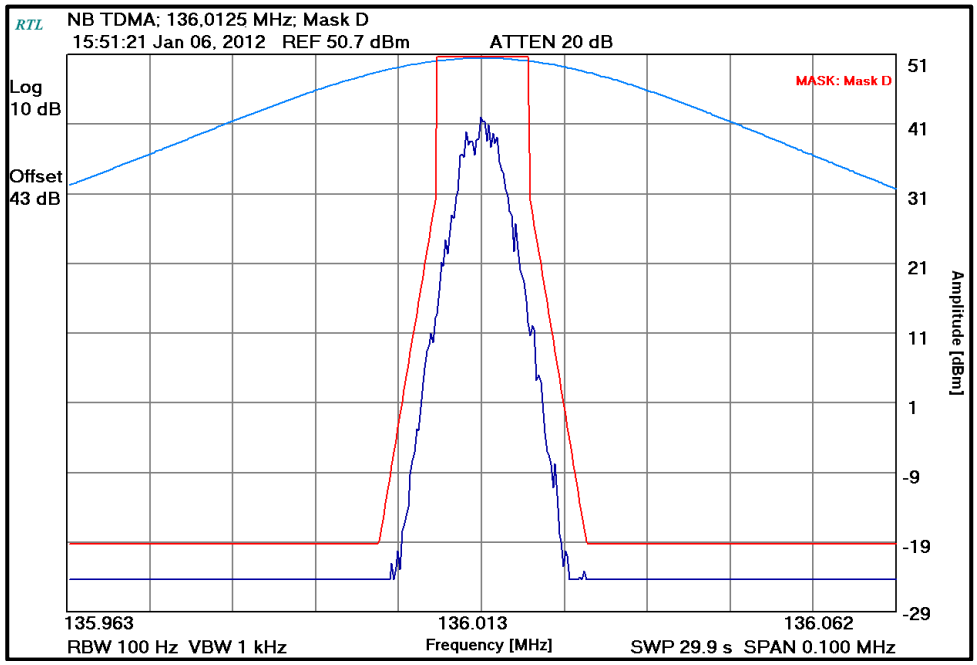
Plot 7-23: Occupied Bandwidth – 162 MHz; 2 level NB 9600 (Mask D)



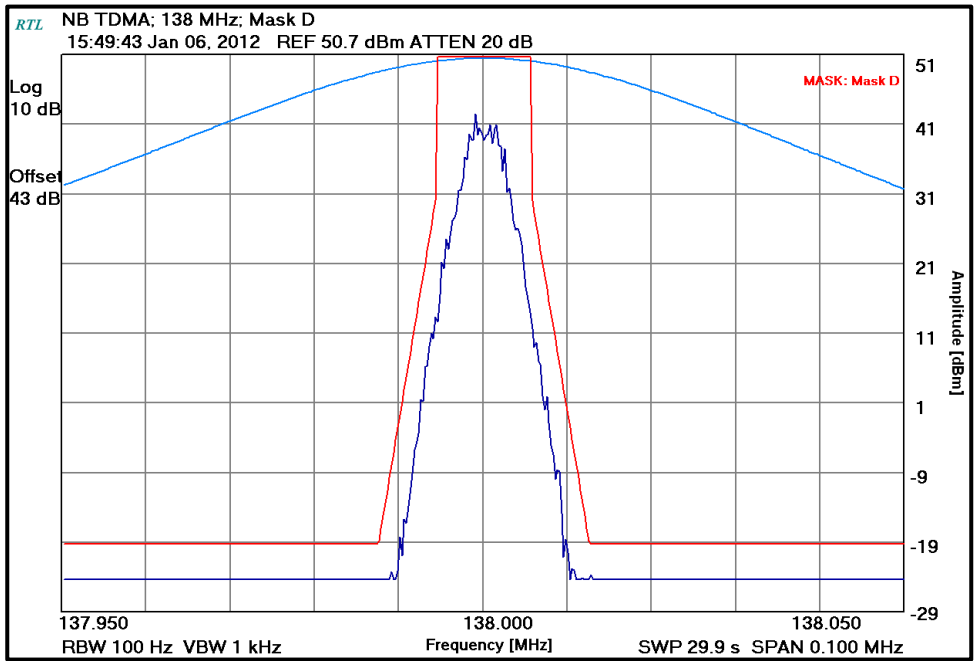
Plot 7-24: Occupied Bandwidth – 173.9875 MHz; 2 level NB 9600 (Mask D)



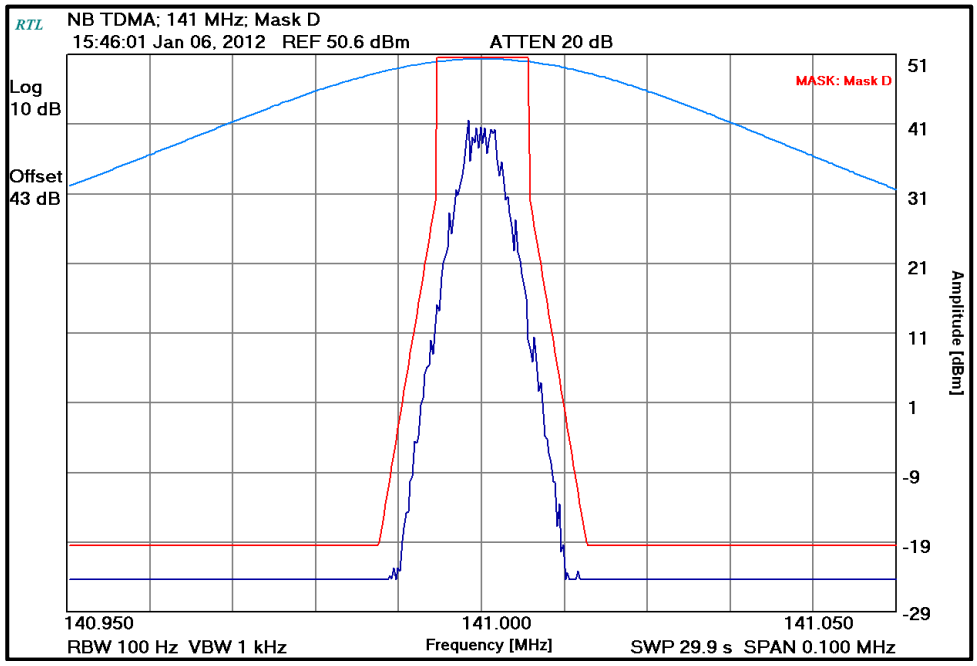
Plot 7-25: Occupied Bandwidth – 136.0125 MHz; OpenSky TDMA (Mask D)



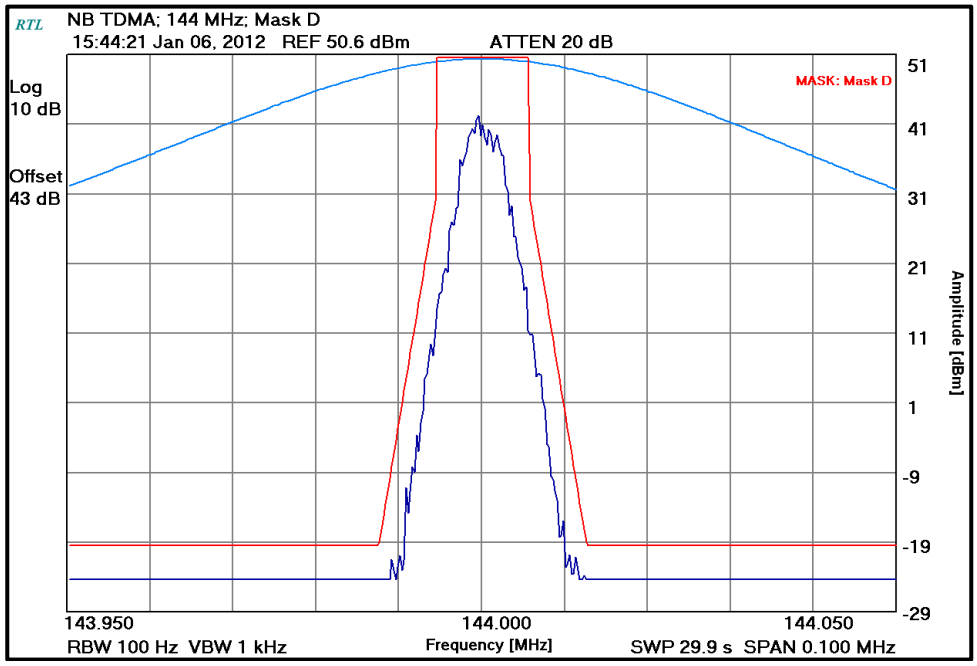
Plot 7-26: Occupied Bandwidth – 138.0 MHz; OpenSky TDMA (Mask D)



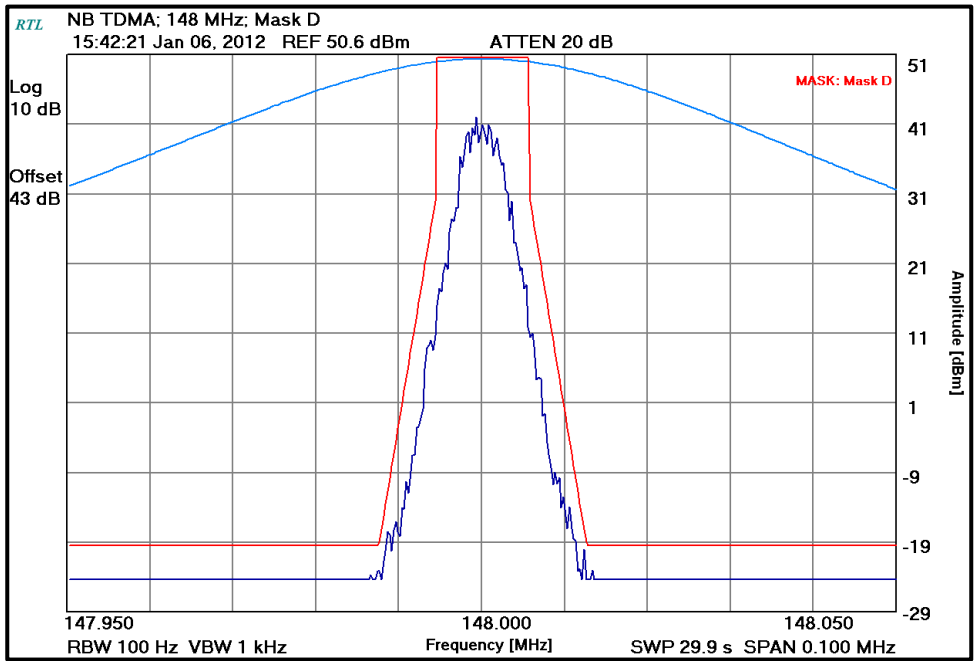
Plot 7-27: Occupied Bandwidth – 141 MHz; OpenSky TDMA (Mask D)



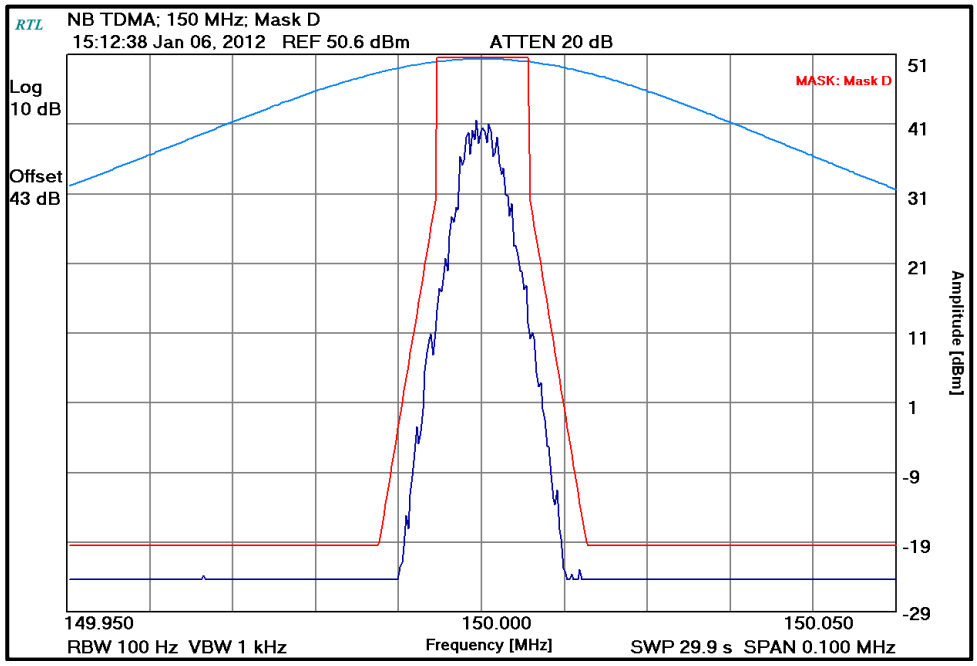
Plot 7-28: Occupied Bandwidth – 144 MHz; OpenSky TDMA (Mask D)



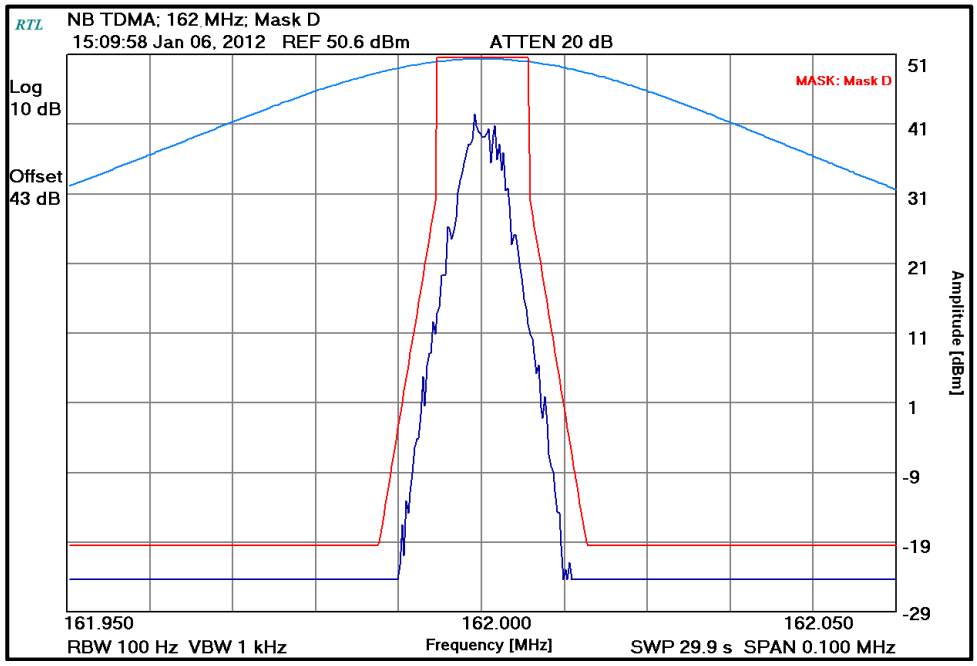
Plot 7-29: Occupied Bandwidth – 148 MHz; OpenSky TDMA (Mask D)



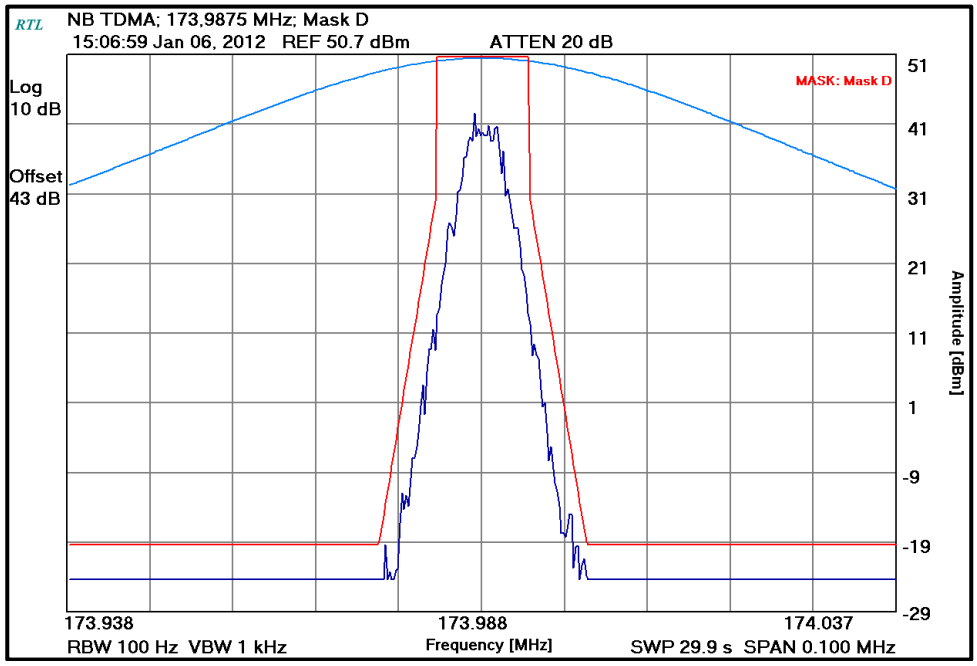
Plot 7-30: Occupied Bandwidth – 150 MHz; OpenSky TDMA (Mask D)



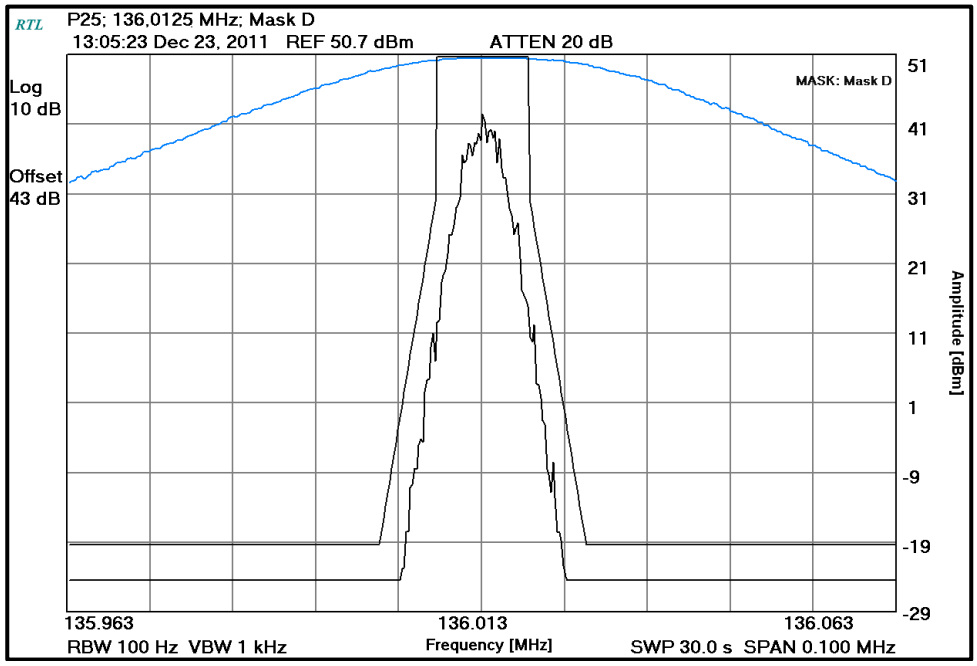
Plot 7-31: Occupied Bandwidth – 162 MHz; OpenSky TDMA (Mask D)



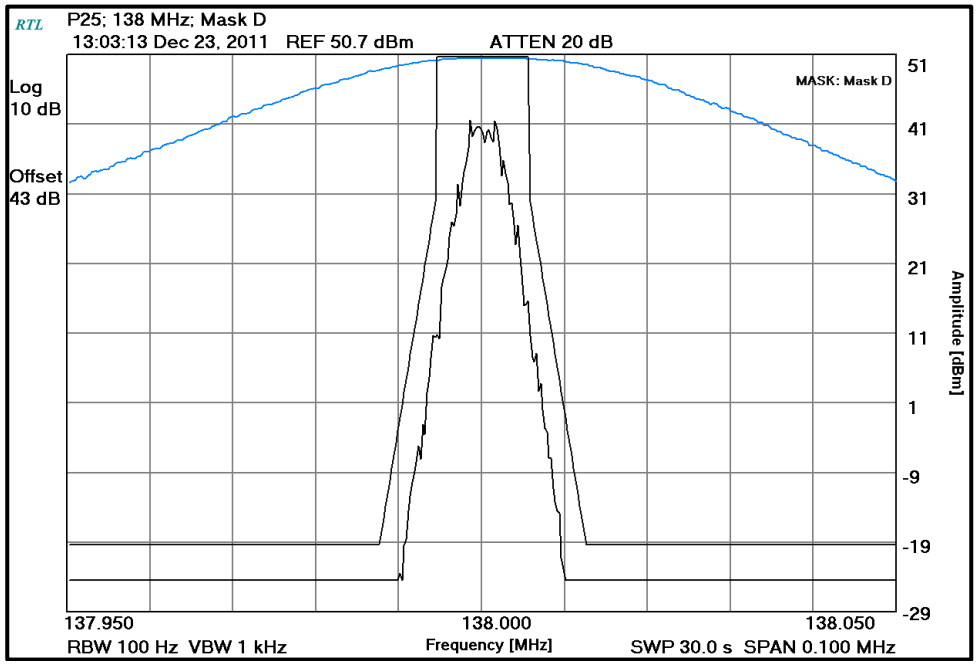
Plot 7-32: Occupied Bandwidth – 173.9875 MHz; OpenSky TDMA (Mask D)



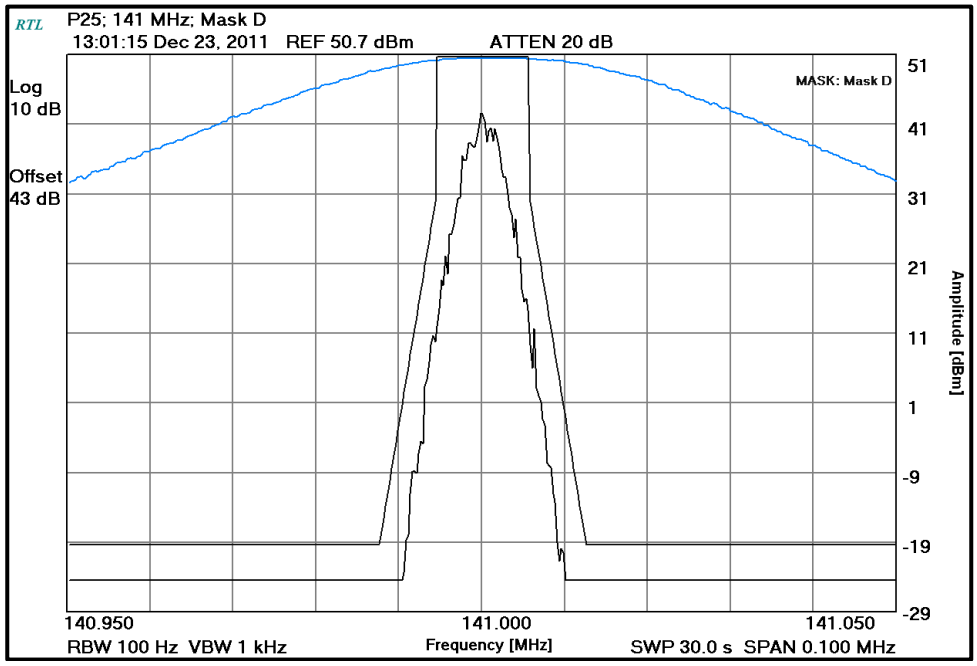
Plot 7-33: Occupied Bandwidth – 136.0125 MHz; P25 (Mask D)



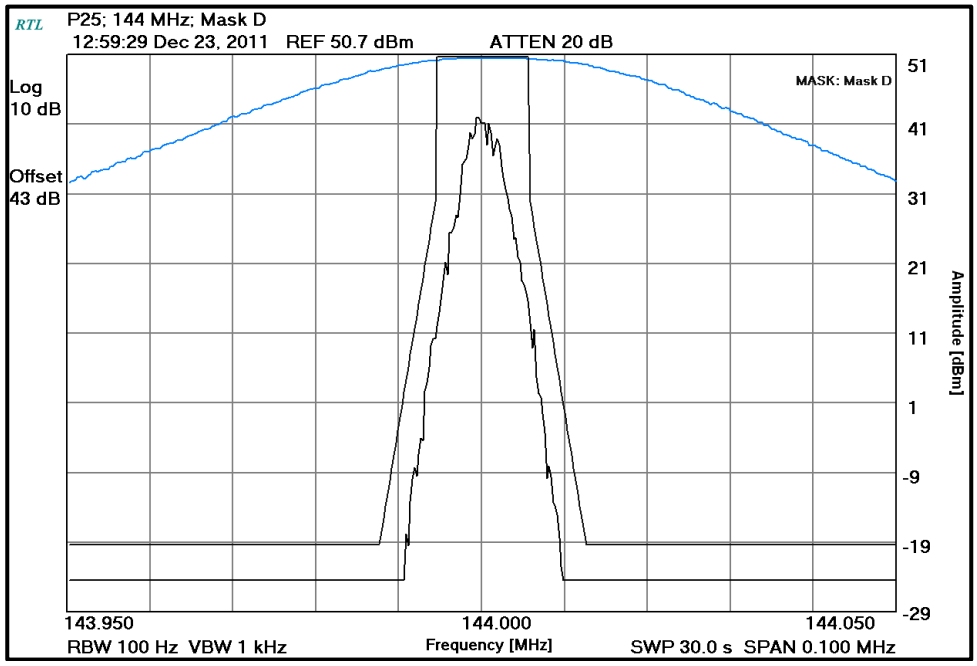
Plot 7-34: Occupied Bandwidth – 138.0 MHz; P25 (Mask D)



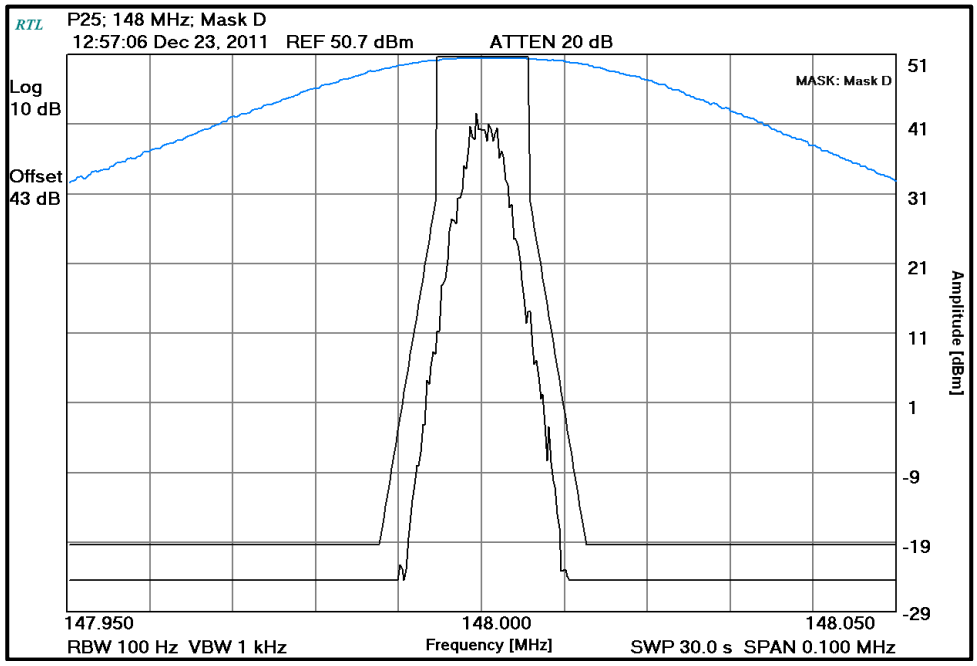
Plot 7-35: Occupied Bandwidth – 141 MHz; P25 (Mask D)



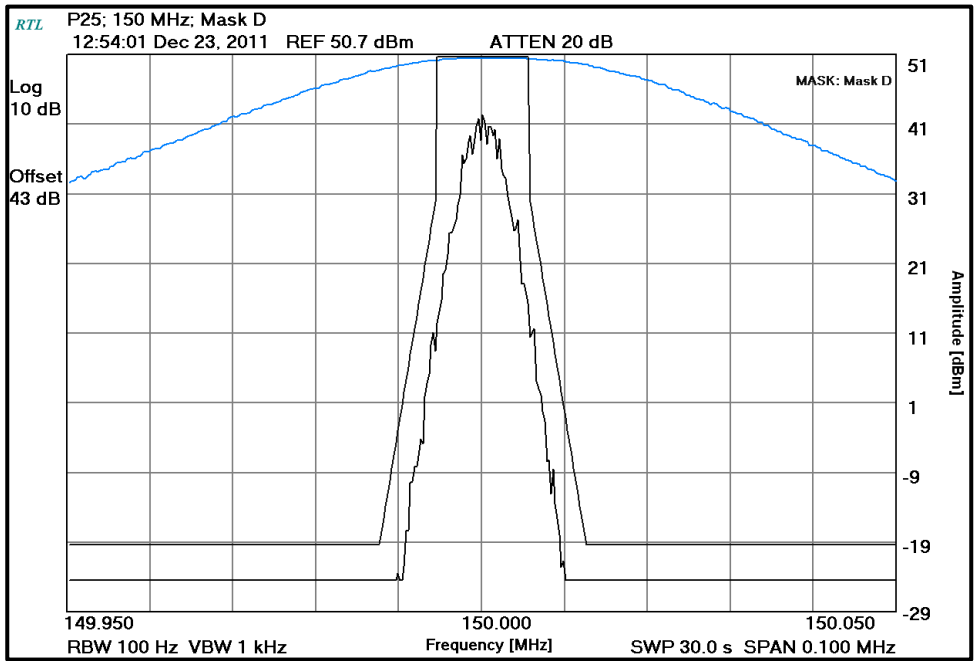
Plot 7-36: Occupied Bandwidth – 144 MHz; P25 (Mask D)



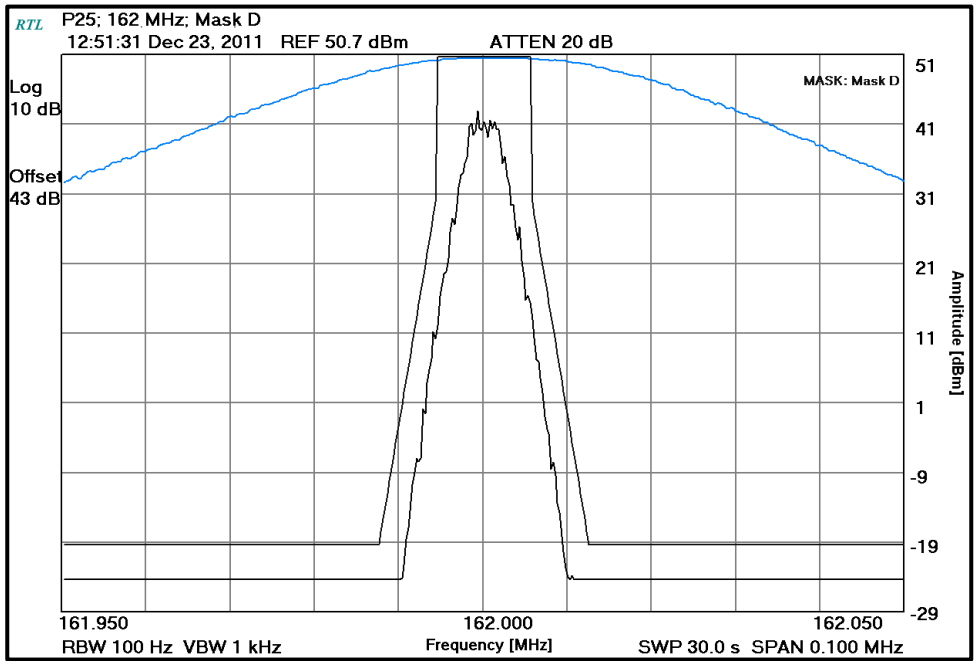
Plot 7-37: Occupied Bandwidth – 148 MHz; P25 (Mask D)



Plot 7-38: Occupied Bandwidth – 150 MHz; P25 (Mask D)



Plot 7-39: Occupied Bandwidth – 162 MHz; P25 (Mask D)



Plot 7-40: Occupied Bandwidth – 173.9875 MHz; P25 (Mask D)

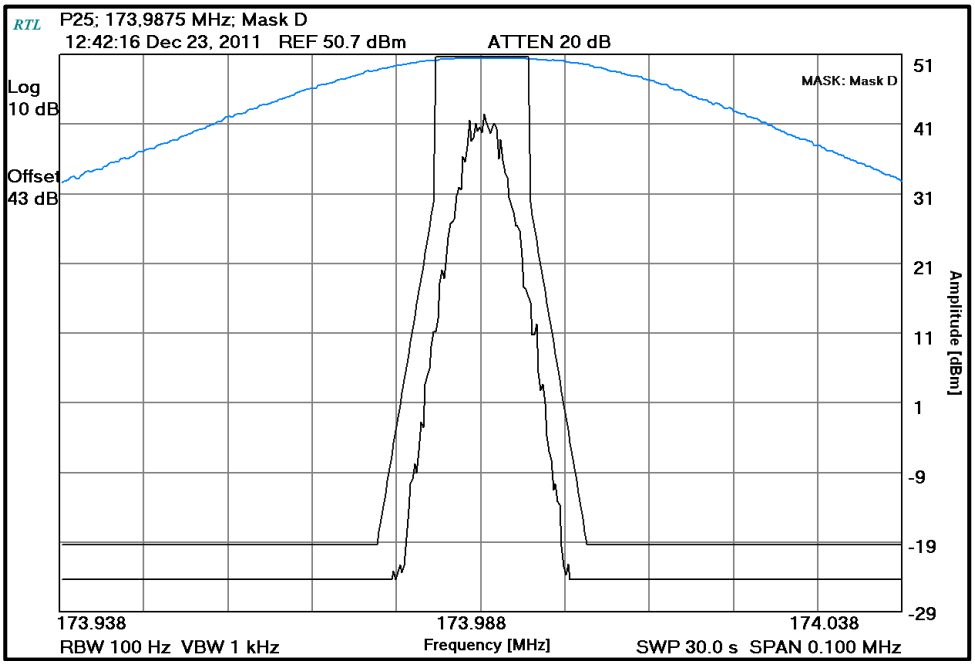


Table 7-1: Test Equipment Used For Testing Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	1/13/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	December 23, 2011- January 6, 2012
Test Engineer	Signature	Dates of Test

8 FCC Rules and Regulation Part 2.1055: Frequency Stability; Part 90.213: Frequency Stability; RSS-119 5.3: Transmitter Frequency Stability

8.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.2

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency. The EUT was evaluated over the temperature range -30°C to +60°C. The temperature was initially set to -30°C and a 2-hour period was observed for stabilization of the EUT. The frequency stability was measured within one minute after application of primary power to the transmitter. The temperature was raised at intervals of 10 degrees centigrade through the range. A ½-hour period was observed to stabilize the EUT at each measurement step and the frequency stability was measured within one minute after application of primary power to the transmitter. The measurement was noted and normalized to 20°C. The voltage stability was measured at +/- 15% and normalized to 20°C.

Limit: 5 ppm for mobile stations (including Mobiles) designed to operate with a 12.5 kHz channel bandwidth

RSS-119 Limits:

Frequency Band (MHz)	Channel Spacing (kHz)	Frequency Stability (ppm)		
		Base/Fixed	Mobile Station	
			>2 watts	≤ 2 watts
138-174	30	5	5	5
	15	2.5	5	5
	7.5	1	2	5

8.2 Test Data

Table 8-1: Temperature Frequency Stability – 148.0 MHz

Temperature (°C)	Frequency (Hz)	ppm
-30	147.999983	-0.11
-20	147.999973	-0.18
-10	147.999984	-0.11
0	147.999994	-0.04
10	147.999994	-0.04
20 (reference)	148.000000	0.00
30	148.000004	0.03
40	148.000000	0.00
50	147.999985	-0.10
60	147.999980	-0.14

8.2.1 Frequency Stability/Voltage Variation

Manufacturer's stated voltage range is 10.9 to 16.3 VDC, 13.6 VDC nominal.

Table 8-2: Frequency Stability/Voltage Variation – 148.0 MHz

Voltage (VDC)	Frequency (Hz)	ppm
10.90	148.000000	0.00
11.56	147.999999	-0.01
13.6 (reference)	148.000000	0.00
15.64	148.000000	0.00
16.30	148.000000	0.00

The worst-case deviation was found to be -0.18 ppm.

Result: The EUT is compliant.

Table 8-3: Test Equipment Used For Testing Frequency Stability

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	01/13/13
901300	Agilent Technologies	53131A	Frequency Counter	MY40001345	7/18/12
901350	Meterman	33XR	Multimeter	040402802	12/28/12

Test Personnel:

Daniel Baltzell		December 27, 2011
Test Engineer	Signature	Date of Test

9 FCC Part 2.1047(a): Modulation Characteristics - Audio Frequency Response

9.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.6

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The input audio level at 1000 Hz was set to produce 20% of the rated system deviation. This point is shown as the 0 dB reference level, noted DEVref. The audio signal generator was varied from 100 Hz to 5 kHz with the input level held constant. The deviation in kHz was recorded using a modulation analyzer as DEVfreq. The response in dB relative to 1 kHz was calculated as follows:

Audio Frequency Response = 20 LOG (DEVfreq/DEVref)

9.2 Test Data

Plot 9-1: Modulation Characteristics - Audio Frequency Response

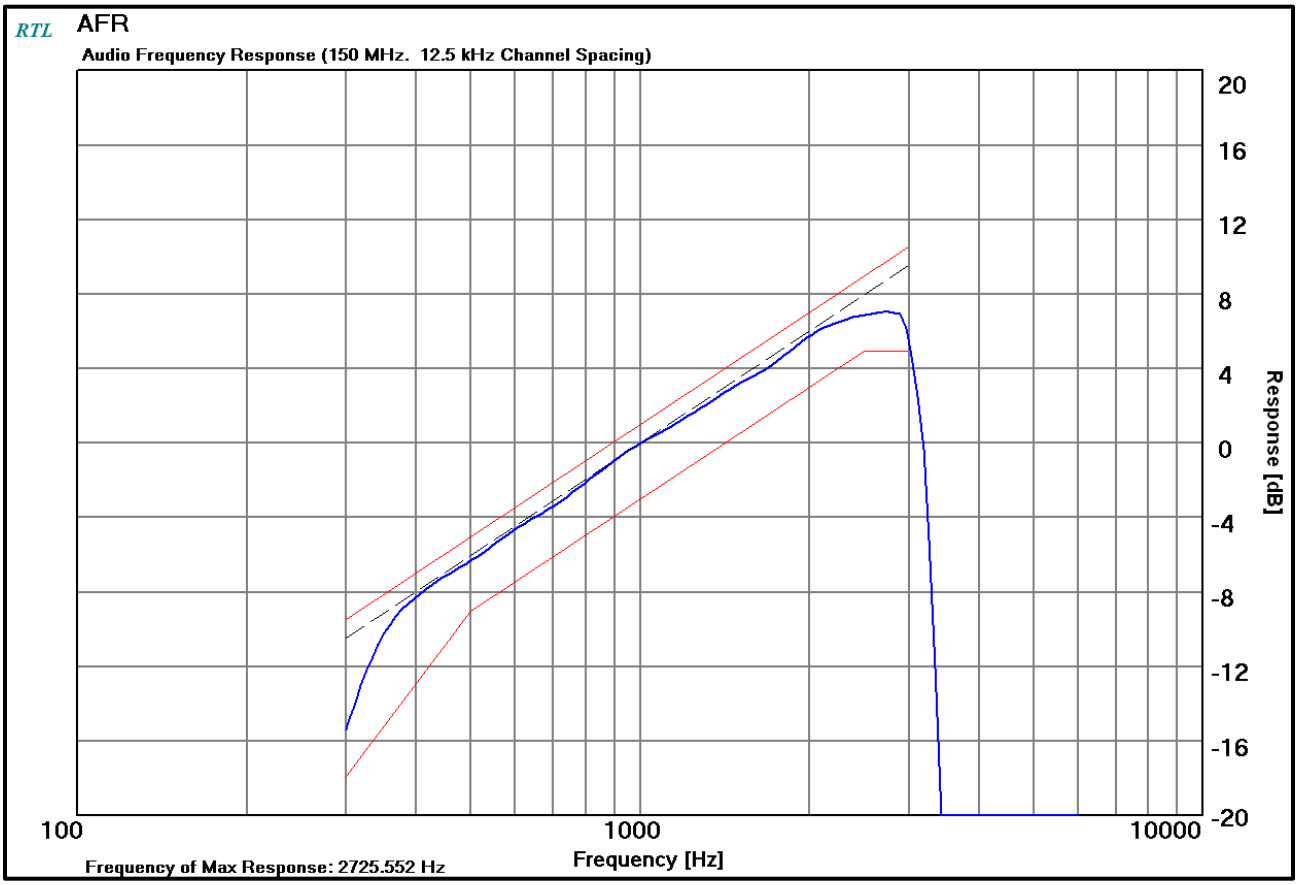


Table 9-1: Test Equipment Used For Testing Audio Frequency Response

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/12
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell		January 10, 2012
Test Engineer	Signature	Date of Test

10 FCC Part 2.1047(a): Modulation Characteristics – Audio Low Pass Filter

10.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.15

The Audio Low Pass Filter Response is the response of the post limiter low pass filter circuit above 3000 Hz.

10.2 Test Data

Plot 10-1: Modulation Characteristics – Audio Low Pass Filter

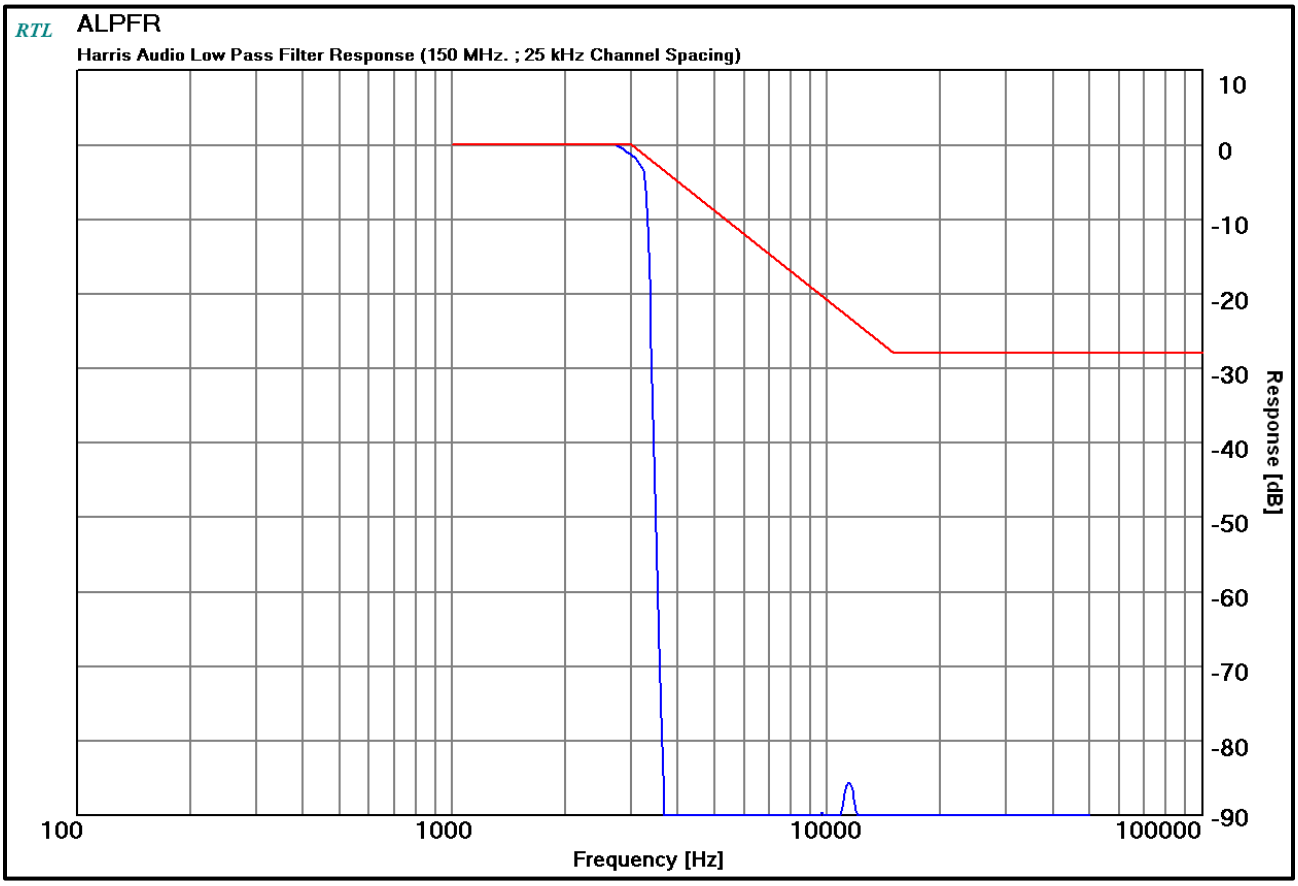


Table 10-1: Test Equipment Used For Testing Audio Low Pass Filter Response

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901054	Hewlett Packard	HP 3586B	Selective Level Meter	1928A01892	3/23/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/12
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell		January 10, 2012
Test Engineer	Signature	Date of Test

11 FCC Rules and Regulations Part 2.1047(b): Modulation Characteristics - Modulation Limiting

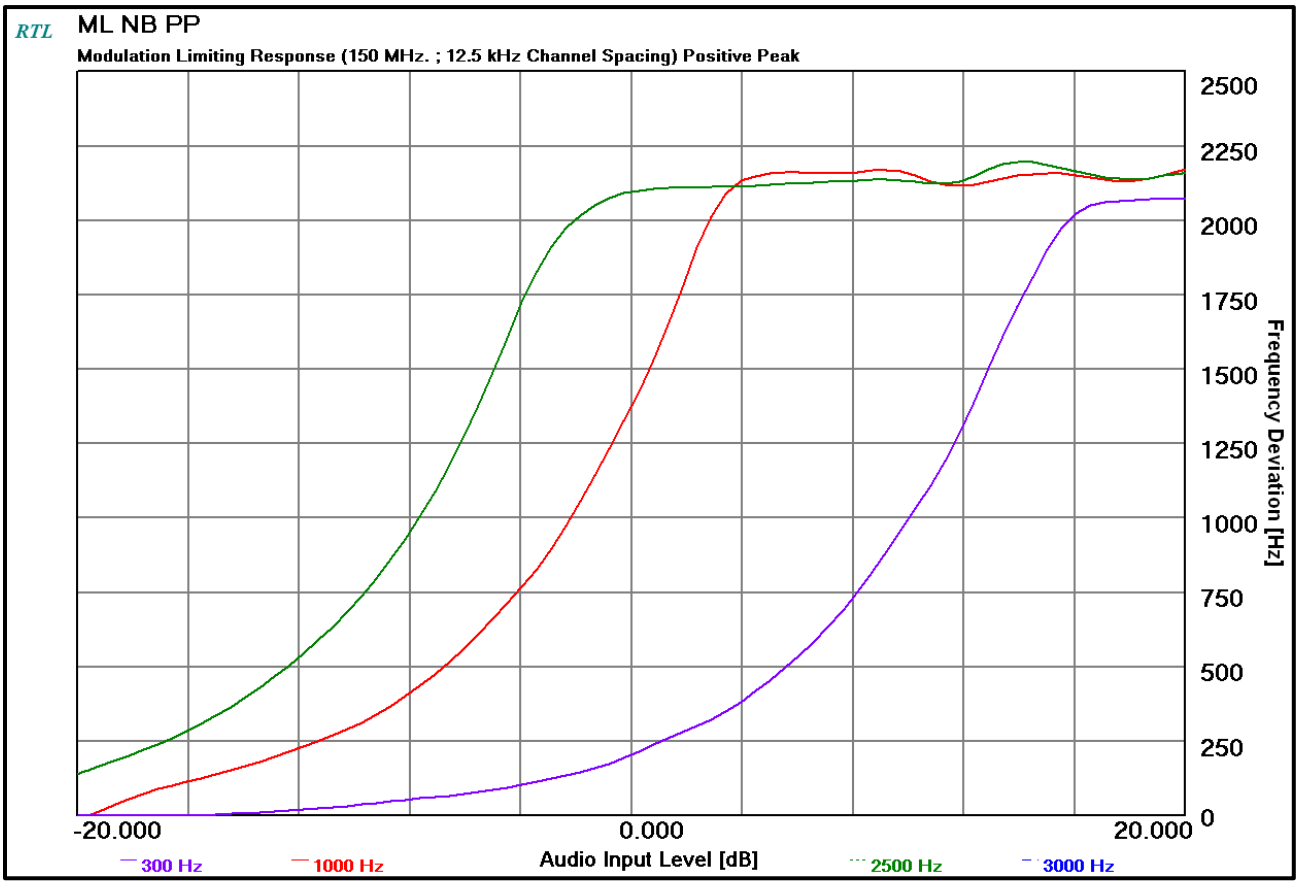
11.1 Test Procedure

ANSI/TIA-603-C-2004 Section 2.2.3

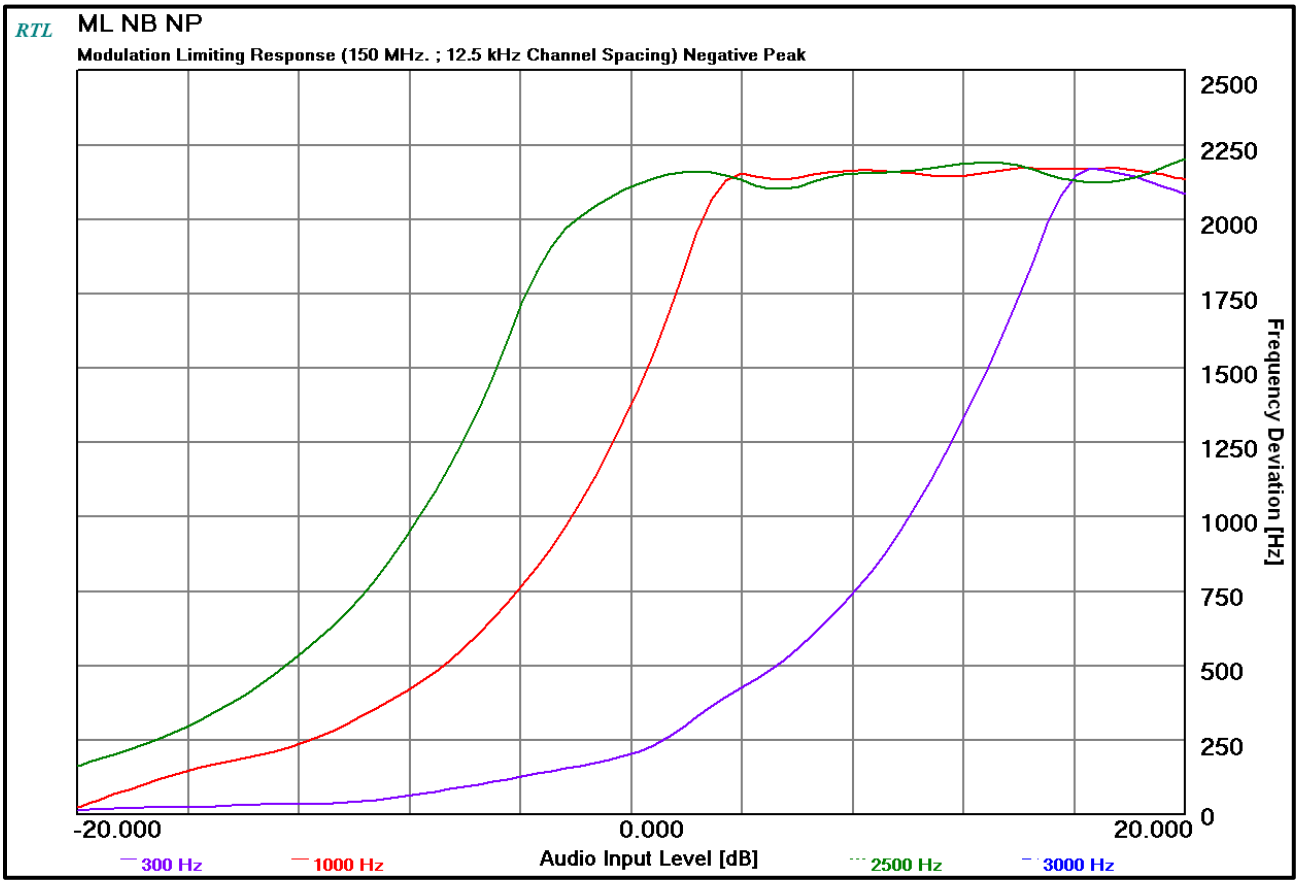
The transmitter was adjusted for full rated system deviation. The audio input level was adjusted for 60% of rated system deviation at 1000 Hz. Using this level (0 dB) as a reference, the audio input level was varied from the reference +/-20 dB for modulation frequencies of 300 Hz, 1,000 Hz, and 2,500 Hz. The system deviation obtained as a function of the input level was recorded. Both positive and negative peak deviations were recorded.

11.2 Test Data

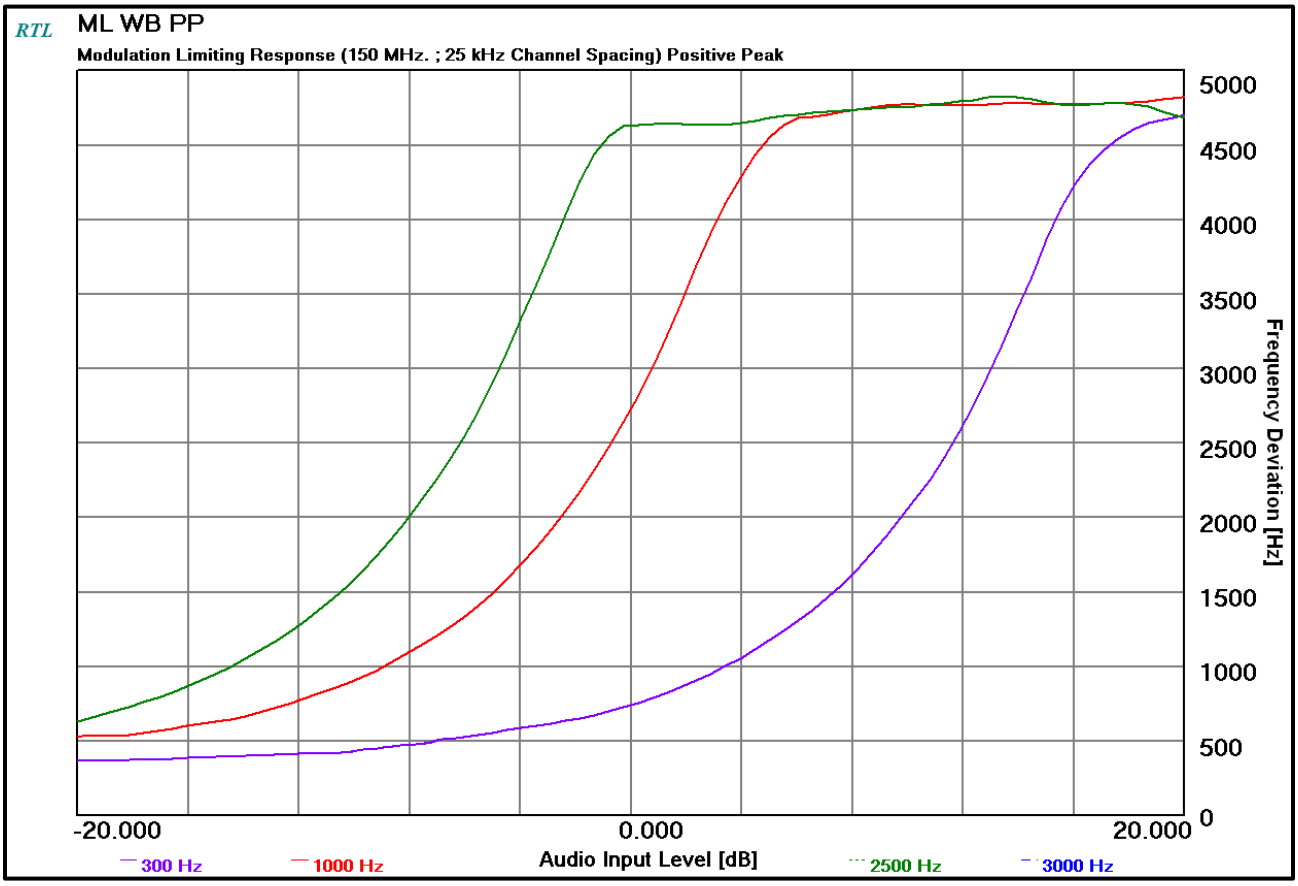
Plot 11-1: Modulation Characteristics – Modulation Limiting; Positive Peak; Narrowband



Plot 11-2: Modulation Characteristics – Modulation Limiting; Negative Peak; Narrowband



Plot 11-3: Modulation Characteristics – Modulation Limiting; Positive Peak; Wideband



Plot 11-4: Modulation Characteristics – Modulation Limiting; Negative Peak; Wideband

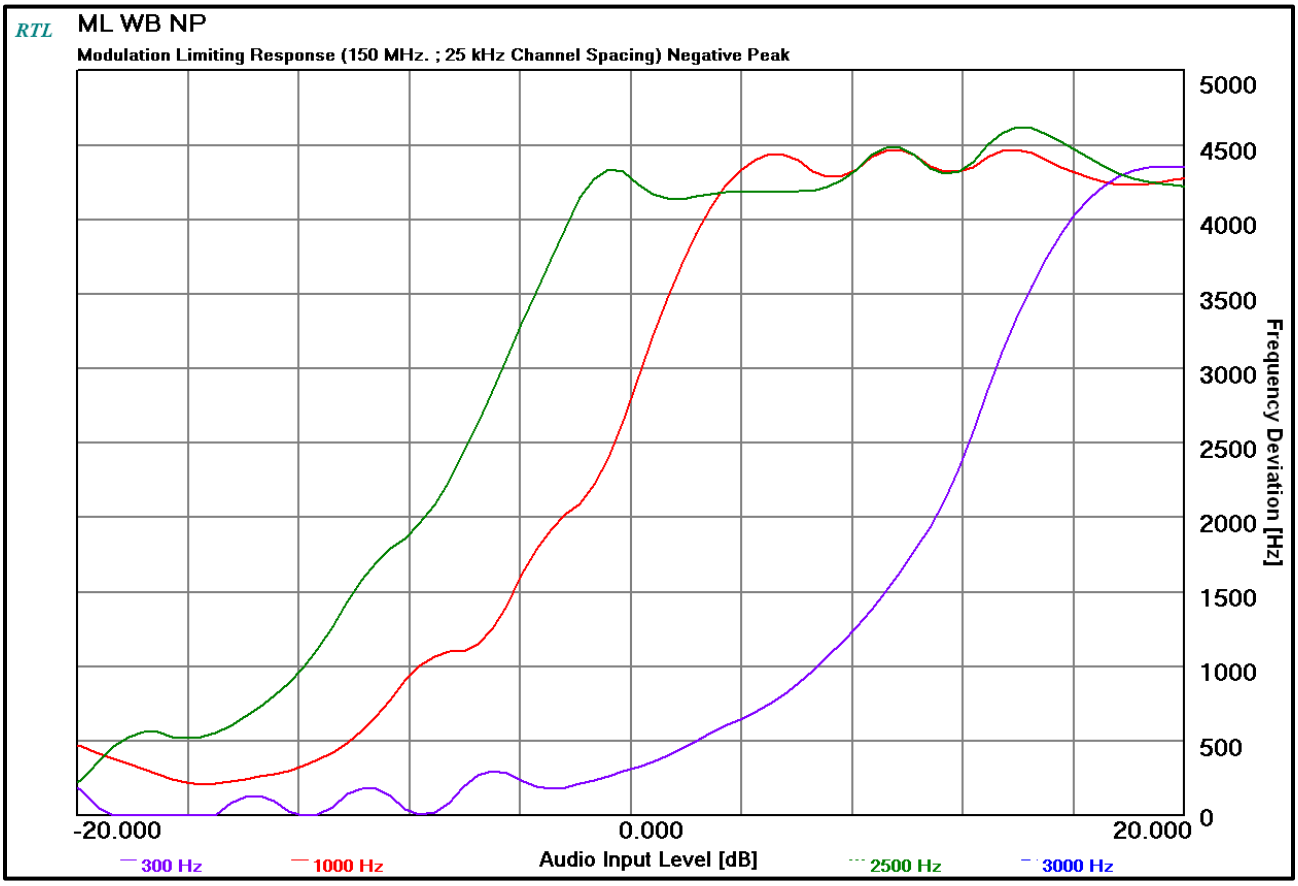


Table 11-1: Test Equipment Used For Testing Modulation Limiting

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901057	Hewlett Packard	3336B	Synthesizer/Level Generator	2514A02585	3/4/12
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/12
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell	Daniel W. Baltzell	January 11-17, 2012
Test Engineer	Signature	Date of Test

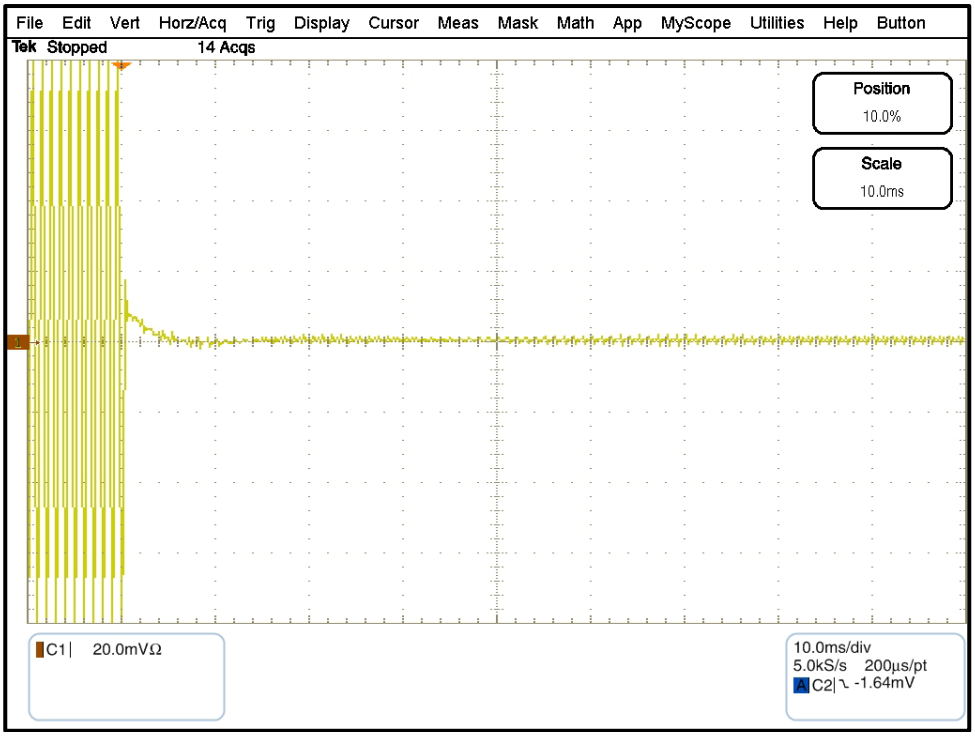
12 FCC Rules and Regulations Part 90.214; IC RSS-119 5.9: Transient Frequency Response

12.1 Test Procedure

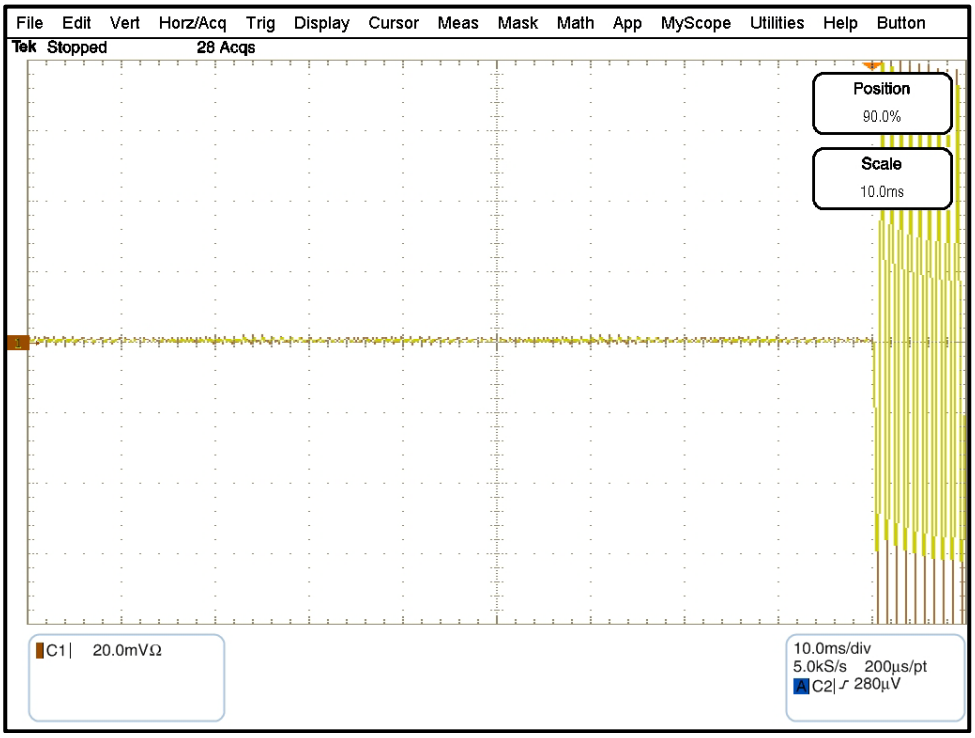
ANSI/TIA-603-C-2004 Section 2.2.3

12.2 Test Data

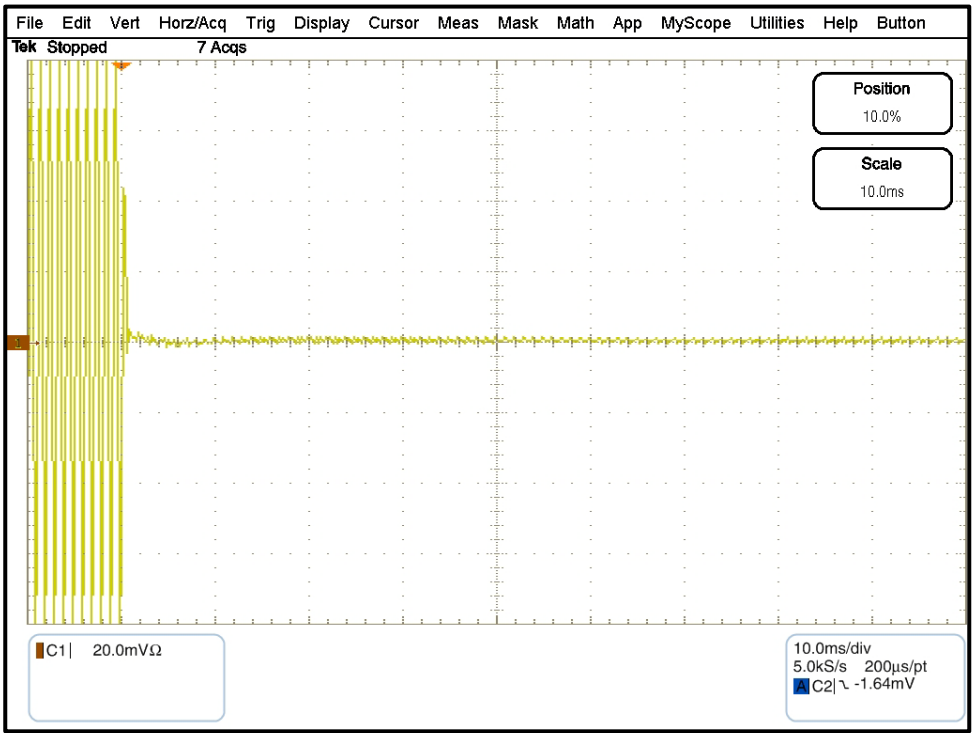
Plot 12-1: Transient Frequency Behavior – 136.0125 MHz; Narrow Band; Carrier On Time



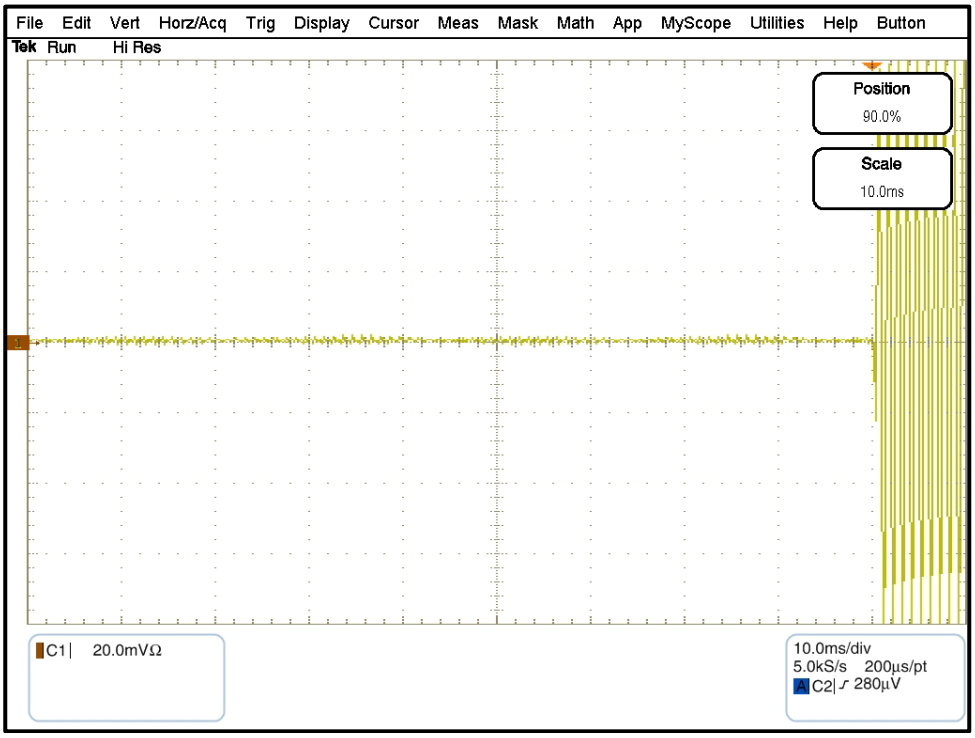
Plot 12-2: Transient Frequency Behavior – 136.0125 MHz; Narrow Band; Carrier Off Time



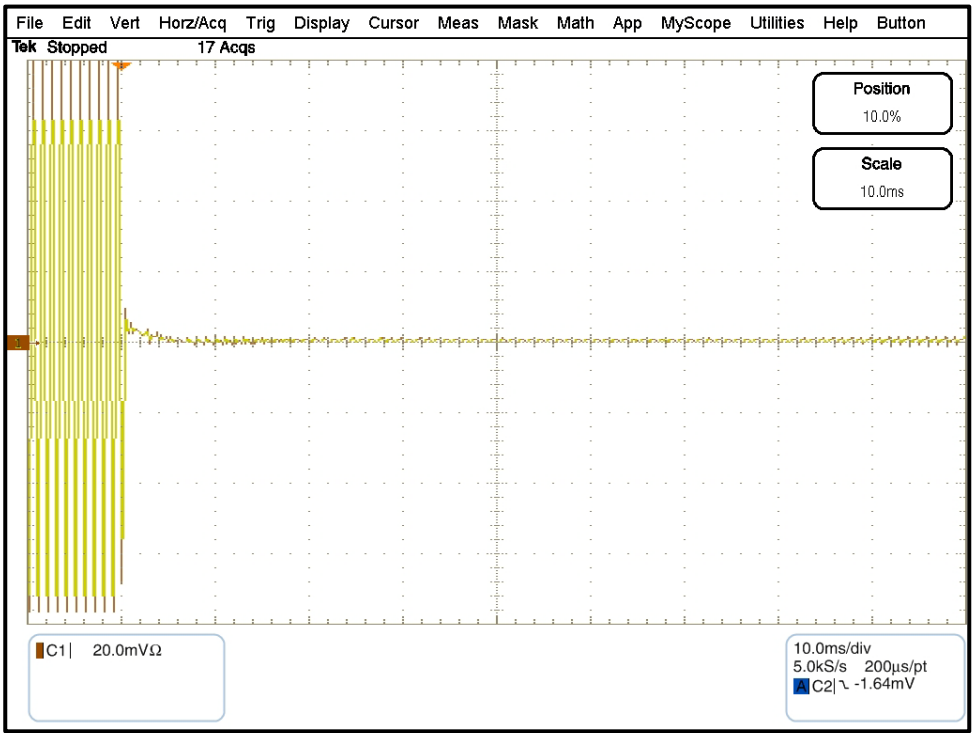
Plot 12-3: Transient Frequency Behavior – 138 MHz; Narrow Band; Carrier On Time



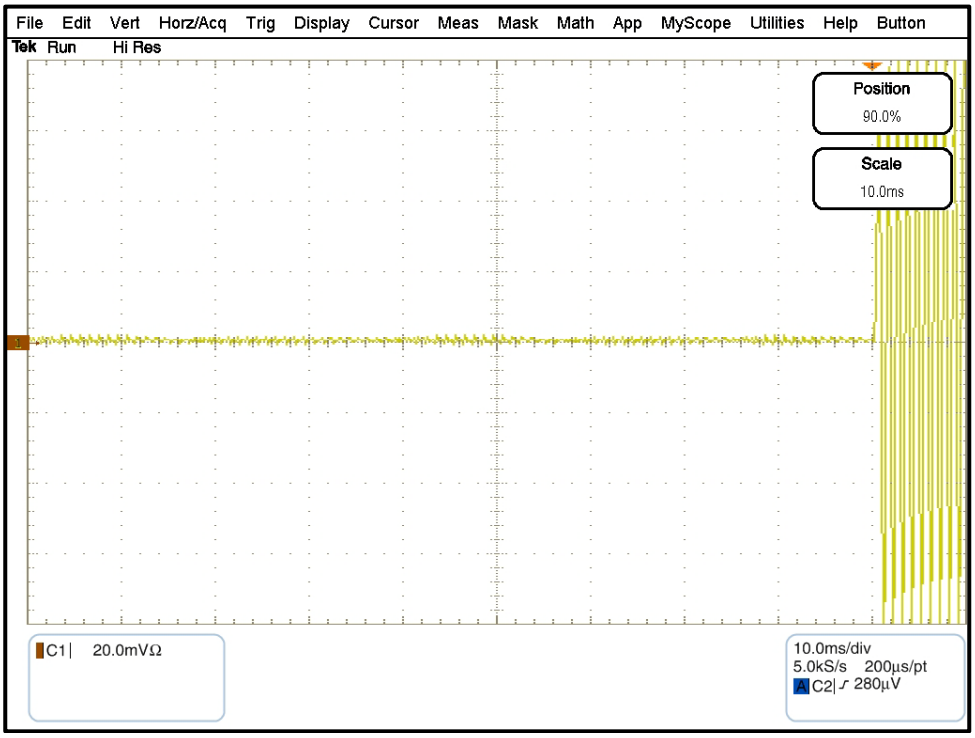
Plot 12-4: Transient Frequency Behavior – 138 MHz; Narrow Band; Carrier Off Time



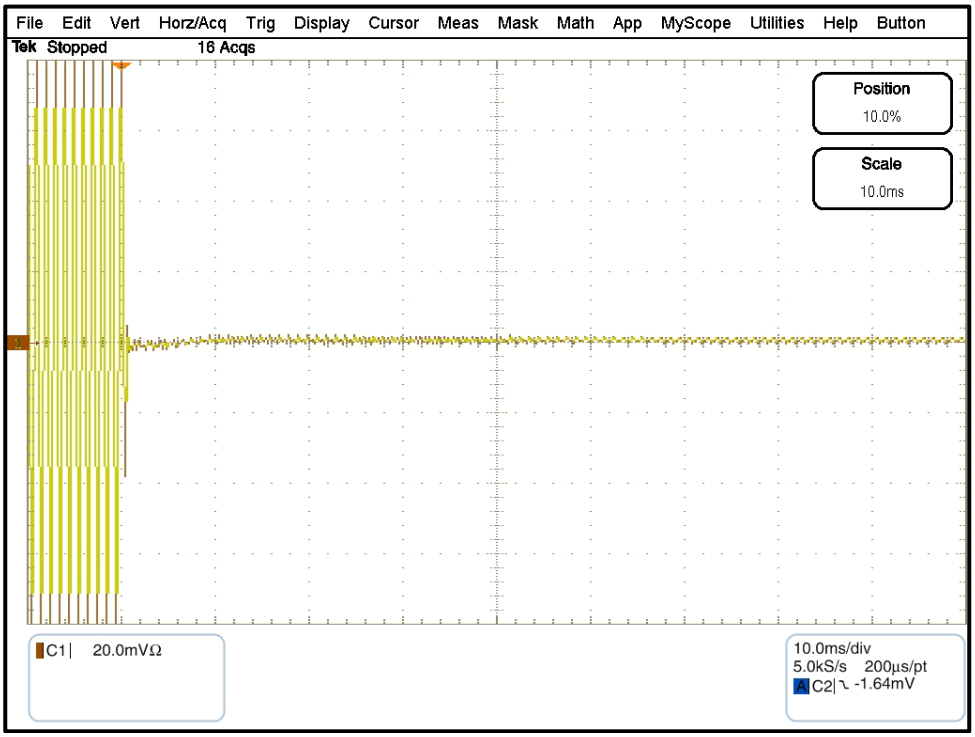
Plot 12-5: Transient Frequency Behavior – 141 MHz; Narrow Band; Carrier On Time



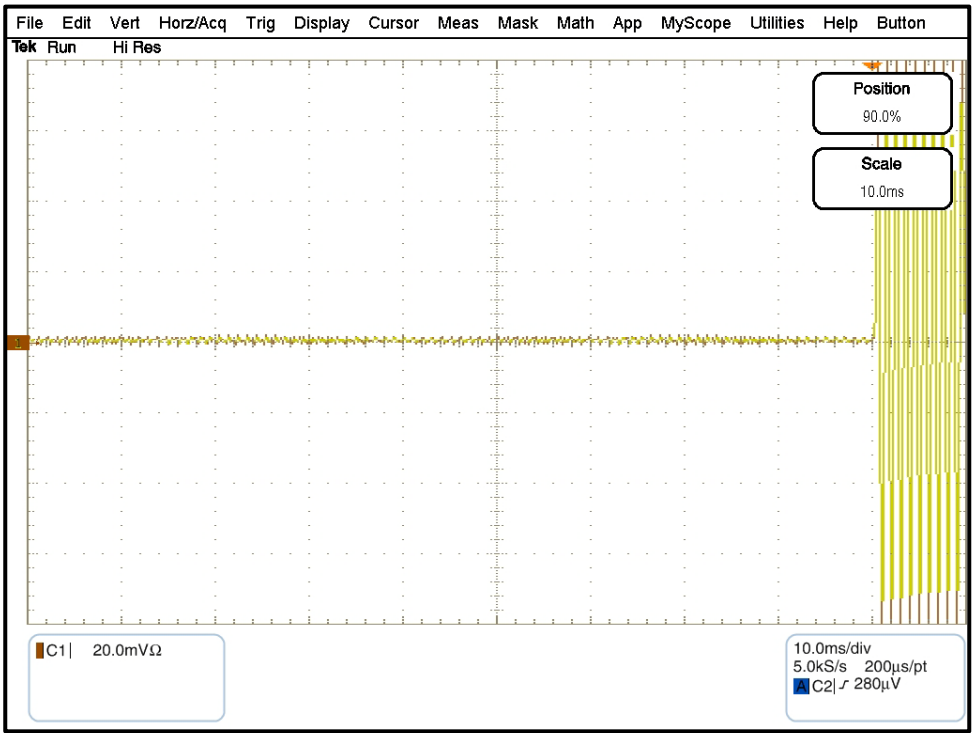
Plot 12-6: Transient Frequency Behavior – 141 MHz; Narrow Band; Carrier Off Time



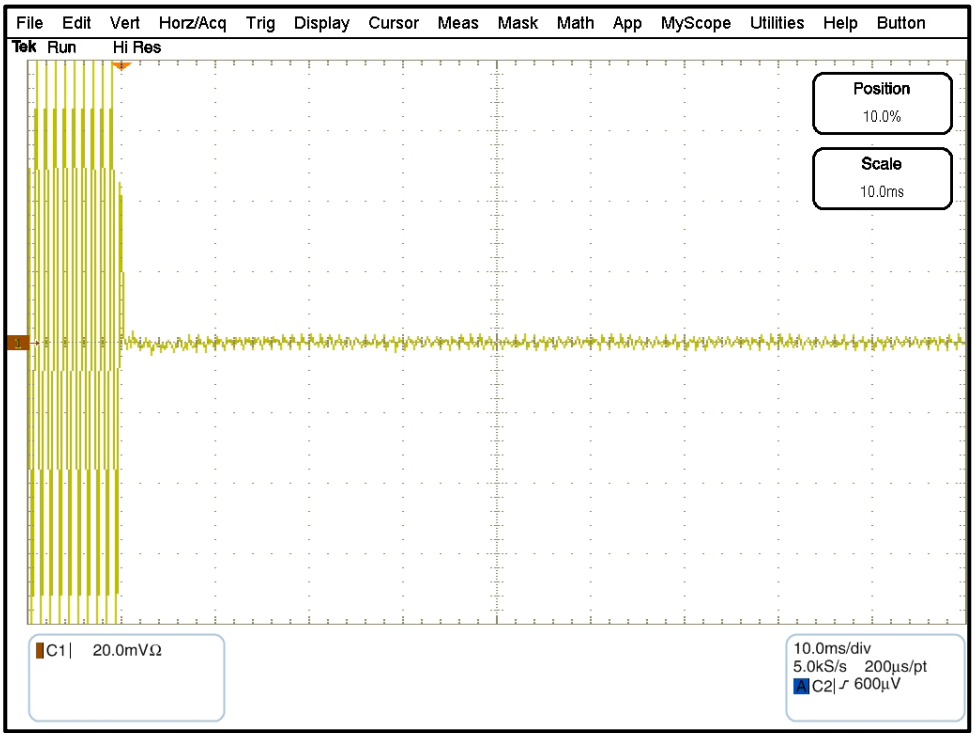
Plot 12-7: Transient Frequency Behavior – 144 MHz; Narrow Band; Carrier On Time



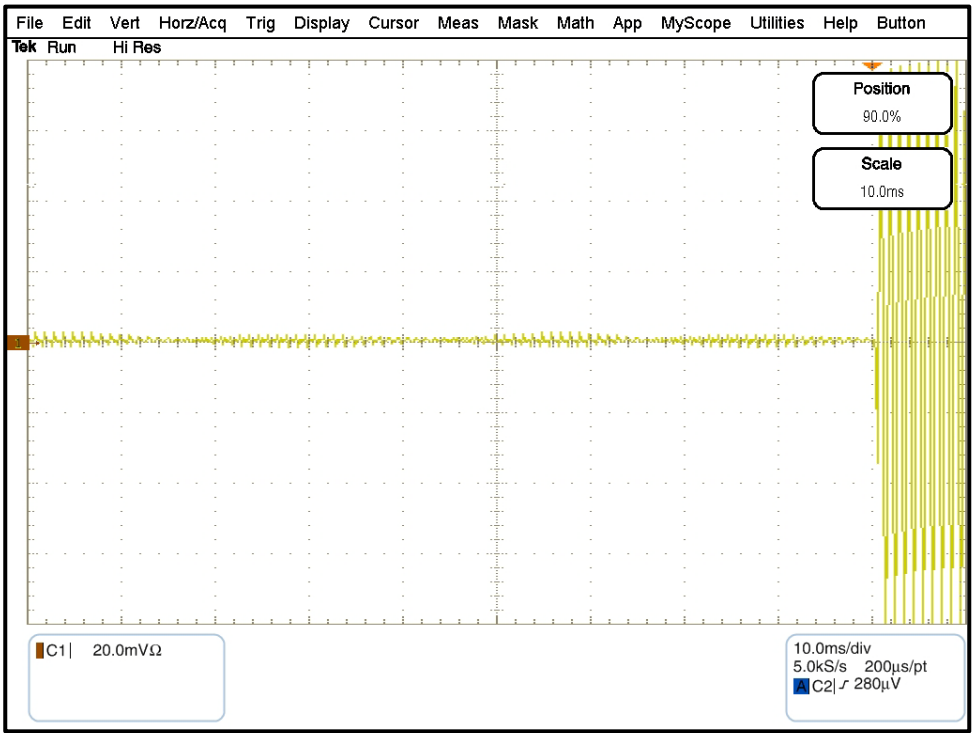
Plot 12-8: Transient Frequency Behavior – 144 MHz; Narrow Band; Carrier Off Time



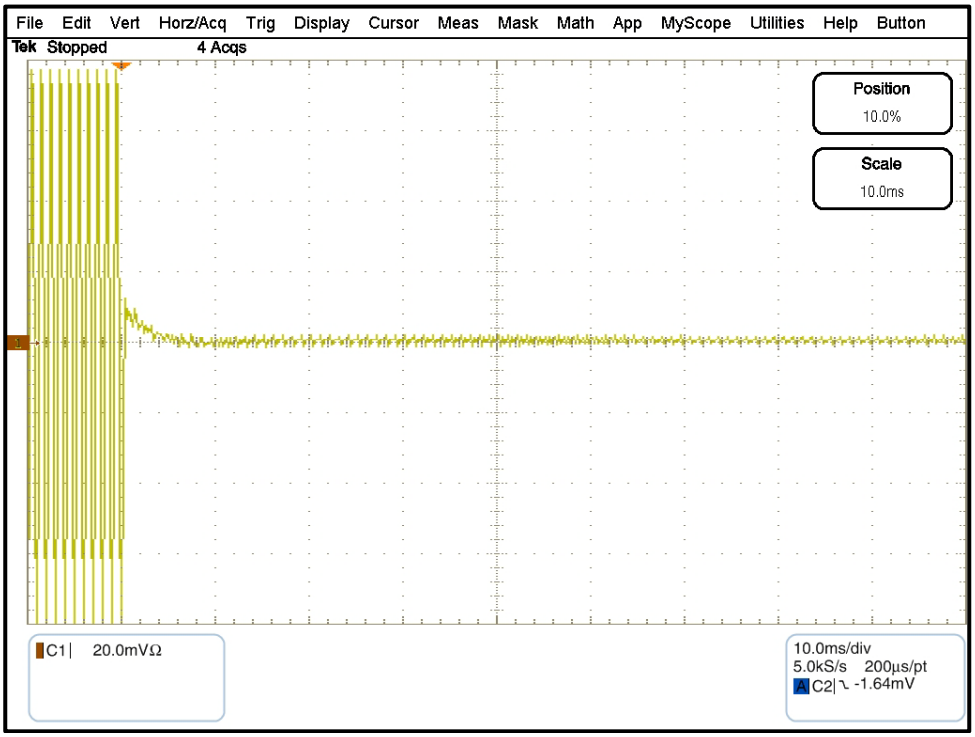
Plot 12-9: Transient Frequency Behavior – 148 MHz; Narrow Band; Carrier On Time



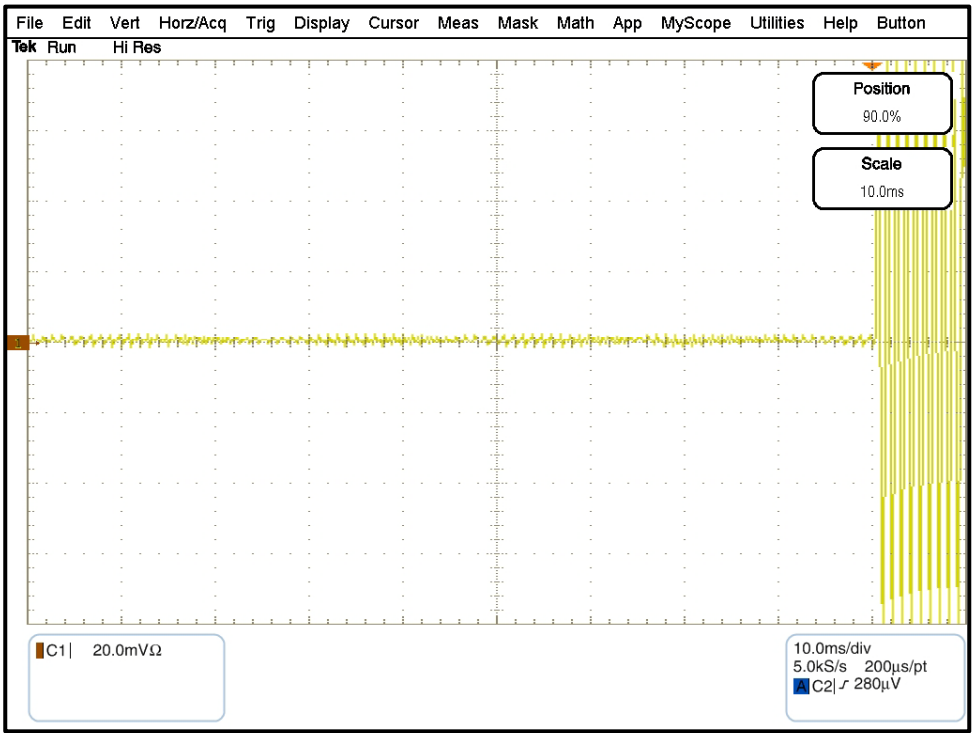
Plot 12-10: Transient Frequency Behavior – 148 MHz; Narrow Band; Carrier Off Time



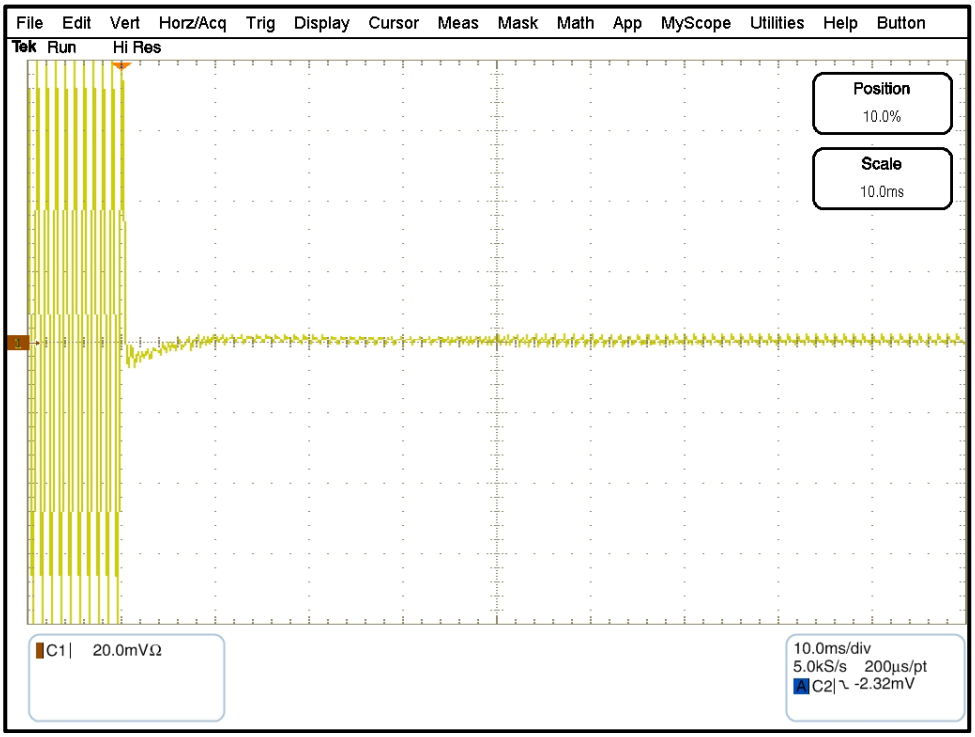
Plot 12-11: Transient Frequency Behavior – 150 MHz; Narrow Band; Carrier On Time



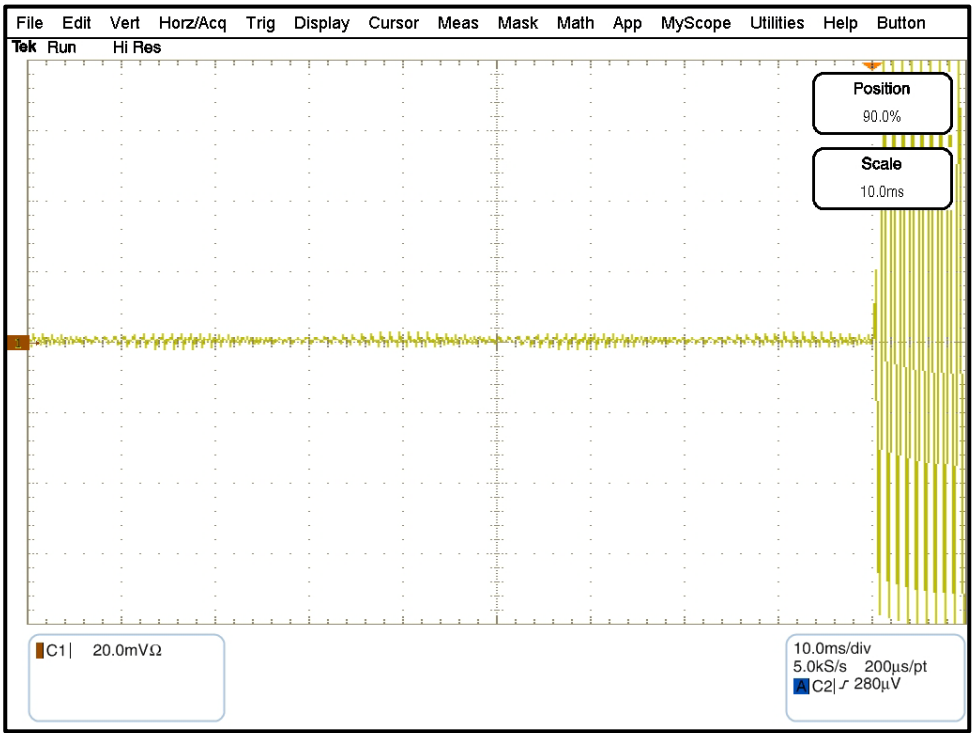
Plot 12-12: Transient Frequency Behavior – 150 MHz; Narrow Band; Carrier Off Time



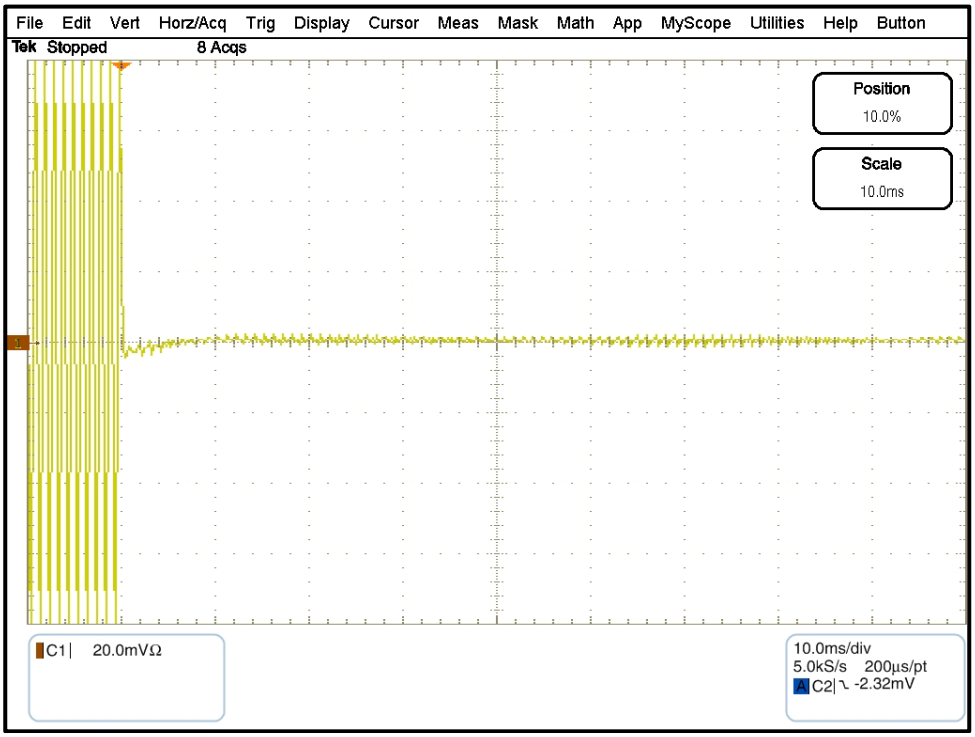
Plot 12-13: Transient Frequency Behavior – 162 MHz; Narrow Band; Carrier On Time



Plot 12-14: Transient Frequency Behavior – 162 MHz; Narrow Band; Carrier Off Time



Plot 12-15: Transient Frequency Behavior – 173.9875 MHz; Narrow Band; Carrier On Time



Plot 12-16: Transient Frequency Behavior – 173.9875 MHz; Narrow Band; Carrier Off Time

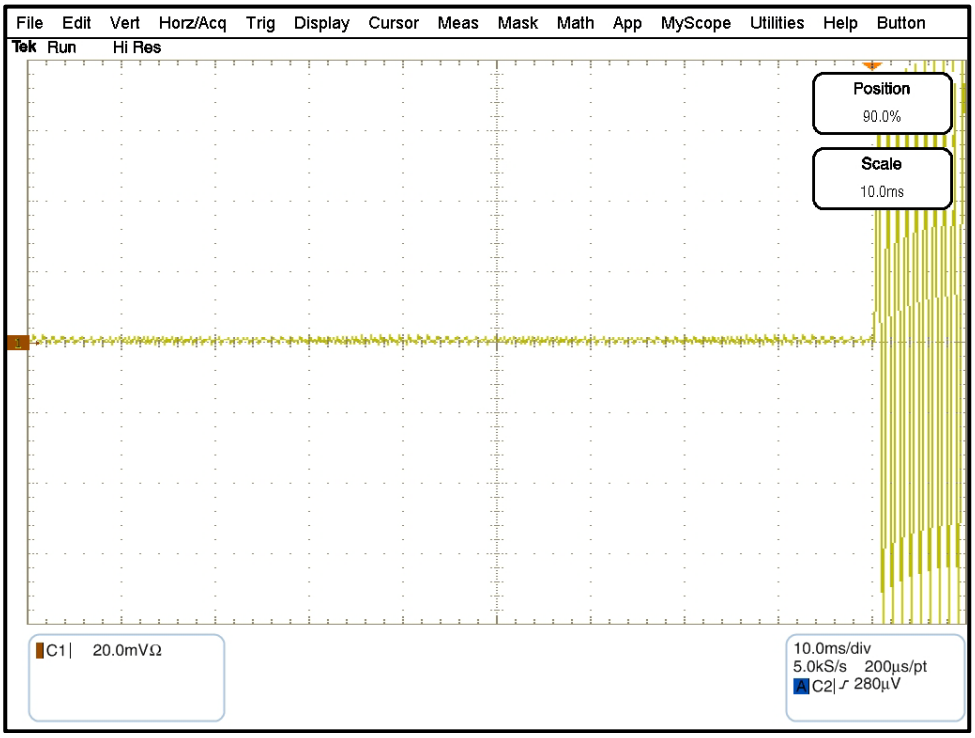


Table 12-1: Test Equipment Used For Testing Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901118	Hewlett Packard	8901A Opt. 002-003	Modulation Analyzer	2406A00178	10/7/12
901514	Tektronix	TDS7404B	Oscilloscope	B010161	6/28/12
900917	Hewlett Packard	8648C	Synthesized. Signal Generator (9 kHz - 3200 MHz)	3537A01741	10/20/12
900948	Weinschel	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	2/17/12
901511	Pasternack	PE 2003	Power Divider (10 MHz - 1 GHz)	NA	N/A
901463	Werlatone Inc.	C1795	Directional Coupler, 100W, 40 dB, 1 - 1000 MHz	4067	2/18/12
901263	Agilent Technologies	.01-12 GHz	SMA Detector	2936A05505	N/A
901537	Aeroflex	48-40-34	40 dB Attenuator	CB6628	10/14/12
901355	JFW Industries	50FH-003-300	300W 3DB DC1000 MHz Attenuator	N/A	7/15/12

Test Personnel:

Daniel Baltzell		January 9, 2012
Test Engineer	Signature	Date of Test

13 FCC Rules and Regulations Part 2.202: Necessary Bandwidth and Emission Bandwidth

Type of Emission: F3E, F1D, F1E

Voice – 12.5 kHz channel separation
Calculation:
Max modulation (M) in kHz: 3.0
Max deviation (D) in kHz: 2.5
Constant factor (K): 1 (assumed)
Bn = 2xM+2xDK = 11.0 kHz
Emission designator: 11K0F3E

Digital Voice and Data (9600N) – 12.5 kHz channel spacing
Calculation:
Data rate in bps (R) = 9600
Peak deviation of carrier (D) = 1893
Bn = 3.86D + 0.27RK = 3.86(1893) + 0.27(9600)(1) = 9.9 kHz
Emission designator: 9K90F1D, 9K90F1E

Digital Voice and Data (4800) – 12.5 kHz channel spacing
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1504
Bn = 3.86D + 0.27RK = 3.86(1504) + 0.27(4800)(1) = 7.1 kHz
Emission designator: 7K10F1D, 7K10F1E

P25 and OpenSky TDMA– 4-level FSK 9600 sps:
Calculation:
Data rate in bps (R) = 4800
Peak deviation of carrier (D) = 1800
Bn = $[4800/\log_2(2) + 2 (1800) (1) = 8.400$ kHz
Emission designator: 8K40F1D, 8K40F1E

14 Conclusion

The data in this measurement report shows that the **Harris Corporation** Model **M7300 VHF, FCC ID: OWDTR-0056-E, IC: 3636B-0056,** complies with all the applicable requirements of Parts 90, 15 and 2 of the FCC Rules, and Industry Canada RSS-119.